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Research Triangle Inst, Research Triangle Park, NC

Prepared for

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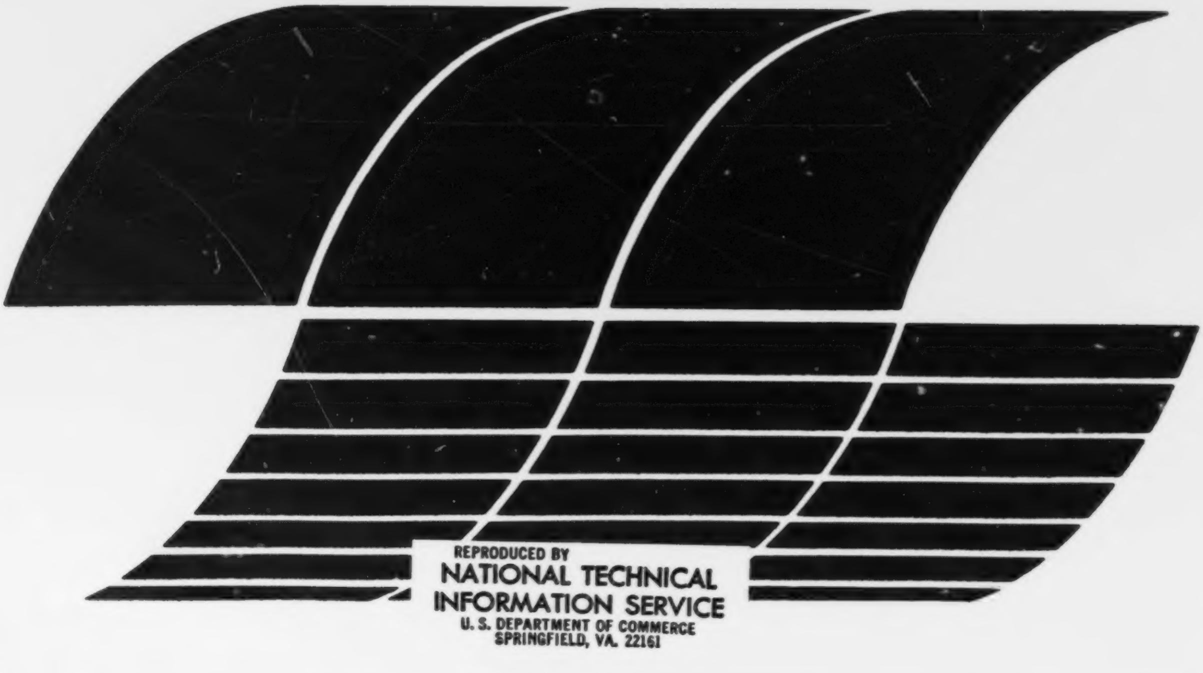
Interagency Energy/Environment R&D Program Report



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16. ABSTRACT
These volumes provide charts and background information summaries for MEG Categories 1-12 and 13-26. They address 586 organic compounds. In the context of deriving MEGs, the volumes: (1) offer perspective on the broad range of contaminants whose control is of vital interest to both industry and the public; (2) further develop and define indicators designating contaminants to be given priority consideration for immediate control and for subsequent research; (3) bring together existing and emerging data in a format efficient for use in environmental assessment; and (4) explore some basic methodologies which both provide the present goals, and suggest directions for refined methodologies. MEGs (multimedia environmental goals) are levels of significant contaminants or degradents (in ambient air, water, or land or in emissions of effluents conveyed to the ambient media) that are judged to be (1) appropriate for preventing certain negative effects in the surrounding populations or ecosystems, or (2) representative of the control limits achievable through technology. MEGs are predicted for more than 650 pollutants.

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Multimedia Environmental Goals for Environmental Assessment; Volume III. MEG Charts and Background Information Summaries (Categories 1-12)

by

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Washington, DC 20460

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ABSTRACT

Multimedia Environmental Goals (MEG's) are levels of significant contaminants or degradents (in ambient air, water, or land or in emissions of effluents conveyed to the ambient media) that are judged to be (1) appropriate for preventing certain negative effects in the surrounding populations or ecosystems, or (2) representative of the control limits achievable through technology. MEG's are projected for more than 650 pollutants. Volumes III and IV address 586 organic compounds.

In the context of deriving MEG's, these volumes attempt (1) to offer perspective on the broad range of contaminants whose control is of vital interest to both industry and the public; (2) to further develop and define indicators designating which contaminants must be given priority consideration for immediate control and for subsequent research; (3) to bring existing and emerging data together in a format efficient for use in environmental assessment; and (4) to explore some basic methodologies which provide the present goals, and which also suggest directions for refined methodologies.

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PREFERRED NAMES AND SYNONYMS FOR ORGANIC COMPOUNDS ADDRESSED BY MEG'S

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Acenaphthene	21A100	Acenaphthene
1-Acenaphthol	18C100	1-Acenaphthol
Acenaphthylene	21A120	Acenaphthylene
Acetaldehyde	07A040	Acetaldehyde
Acetamide	08C040	Acetamide
Acetic acid	08A040	Acetic acid
Acetic acid amide	08C040	Acetamide
Acetic aldehyde	07A040	Acetaldehyde
Acetone	07B020	Acetone
Acetone dichloride	02A344	2,2-Dichloropropane
Acetonitrile	09A020	Acetonitrile
Acetophenone	07B120	Acetophenone
Acetylbenzene	07B120	Acetophenone
Acetylene	01C020	Acetylene
Acetylene dichloride	02B040	1,2-Dichloroethene
Acetylene tetrachloride	02A300	1,1,2,2-tetrachloroethane
Acridan	23B100	Dihydroacridine
Acridine	23B080	Acridine
Acrolein	07A060	Acrolein
Acrolein dichloride	02B106	3,3-Dichloropropene
Acrylic aldehyde	07A060	Acrolein
Acrylon	09A040	Acrylonitrile
Acrylonitrile	09A040	Acrylonitrile
Active amyl alcohol	05A122	2-Methyl-1-butanol
Adipic acid	08A180	Adipic acid
Aerothene TT	02A280	Trichloroethane
Alkanes (C = 10, 11)	01A240	Alkanes (C = 10, 11)
Allylamine	10A110	3-Aminopropene
3-Amiro propylene	10A110	3-Aminopropene
Amino-methane	10A020	Methylamine
2-Amino-1-propanol	10A121	2-Amino-1-propanol
3-Amino-1-propanol	10A122	3-Amino-1-propanol
4-Amino-1,2-dimethyl benzene	10C065	3,4-Xylidine
2-Amino-1,3-dimethyl benzene	10C064	2,6-Xylidine
2-Amino-1,4-dimethyl benzene	10C063	2,5-Xylidine
2-Amino-2-methylpropane	10A143	2-Amino-2-methylpropane
1-Amino-2-propanol	10A123	1-Amino-2-propanol
1-Amino-2,3-dimethyl benzene	10C061	2,3-Xylidine
1-Amino-2,4-dimethyl benzene	10C062	2,4-Xylidine
Di[-4-amino-3-chlorophenyl]methane	10C180	4,4'-Methylene bis(2-chloroaniline)
1-Amino-3,5-dimethyl benzene	10C066	3,5-Xylidine
2-Amino-4,6-dinitrophenol	20A080	2-Amino-4,6-dinitrophenol
4-Aminoaniline	10C100	1,4-Diaminobenzene
Aminoanisole	10C080	Anisidines
2-Aminoanisole	10C081	o-Anisidine
4-Aminoanisole	10C083	p-Anisidine
Aminobenzene	10C020	Aniline
4-Aminobiphenyl	10C120	4-Aminobiphenyl
1-Aminobutane	10A141	1-Aminobutane
2-Aminobutane	10A142	2-Aminobutane
Aminobutanes	10A140	Butylamines
Aminocaproic acid	08B100	6-Aminohexanoic acid
6-Aminocaproic acid	08B100	6-Aminohexanoic acid
Aminocyclohexane	10A160	Cyclohexylamine
Aminodimethylbenzenes	10C060	Dimethylanilines
1-Aminoethane	10A040	Ethlyamine
2-Aminoethanol	10A060	Ethanolamine
6-Aminohexanoic acid	08B100	6-Aminohexanoic acid
6-Aminohexanoic lactam	08C060	6-Hexanelactam
1-Aminonaphtnalene	10C200	1-Aminonaphthalene
2-Aminonaphthalene	10C220	2-Aminonaphthalene
1-Aminopropane	10A100	1-Aminopropane
3-Aminopropene	10A110	3-Aminopropene
2-Aminopropylalconol	10A121	2-Amino-1-propanol
2-Aminotoluene	10C041	2-Aminotoluene
3-Aminotoluene	10C042	3-Aminotoluene

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
4-Aminotoluene	10C043	4-Aminotoluene
Aminotoluenes	10C040	Aminotoluenes
n-Amyl acetate	08D141	n-Amyl acetate
sec-Amyl acetate	08D142	sec-Amyl acetate
Amyl acetates	08D140	Amyl acetates
Amyl acetic ether	08D141	n-Amyl acetate
Amyl alcohol	05A121	n-Pentanol
sec-Amyl alcohol	05B061	2-Pentanol
t-Amyl alcohol	05C040	t-Pentanol
Amyl alcohols	05A120	Pentanols, (primary)
Amyl alcohols	05B060	Pentanols, (secondary)
Amyl hydride	01A101	n-Pentane
a-n-Amylene	01B101	1-Pentene
cis-B-n-Amylene	01B102	cis-2-Pentene
trans-B-n-Amylene	01B103	trans-2-Pentene
Amylenes	01B100	Pentenes
Di-n-amylnitrosamine	12A100	N-Nitrosodipentylamine
Aniline	10C020	Aniline
o-Anisidine	10C081	o-Anisidine
m-Anisidine	10C082	m-Anisidine
p-Anisidine	10C083	p-Anisidine
Anisidines	10C080	Anisidines
Anthracene	21A140	Anthracene
2-Anthracenethiol	13A121	2-Anthracenethiol
9-Anthracenethiol	13A122	9-Anthracenethiol
Anthracenethiols	13A120	Anthracenethiols
Anthraquinone-disulfonic acids	14A040	Anthraquinone-disulfonic acids
9,10-Anthraquinone-1,5-disulfonic acid	14A041	9,10-Anthraquinone-1,5-disulfonic acid
9,10-Anthraquinone-1,6-disulfonic acid	14A042	9,10-Anthraquinone-1,6-disulfonic acid
9,10-Anthraquinone-1,7-disulfonic acid	14A043	9,10-Anthraquinone-1,7-disulfonic acid
9,10-Anthraquinone-1,8-disulfonic acid	14A044	9,10-Anthraquinone-1,8-disulfonic acid
Aroclors	16A220	Polychlorinated biphenyls (PCB's)
1-Aza-2,4-cyclopentadiene	23C020	Pyrrole
10-Azaanthracene	23B080	Acridine
Azabenzene	23A020	Pyridine
Azacyclopropane	10B020	Ethyleneimine
2-Azafluoranthene	23B300	Indeno(1,2,3-ij)isoquinoline
9-Azafluorene	23C080	Carbazole
1-Azaindene	23C040	Indole
9-Azaphenanthrene	23B120	Phenanthridine
Azimethylene	11A020	Diazomethane
Azine	23A020	Pyridine
Aziridine	10B020	Ethyleneimine
Azole	23C020	Pyrrole
B(a)P	21C100	Benzo(a)pyrene
B(b)F	22C080	Benzo(b)fluoranthene
B(j)F	22C040	Benzo(j)fluoranthene
BA	21B040	Benz(a)anthracene
Banana oil	08D143	Isoamyl acetate
Benz(a)acridine	23B120	Benz(a)acridine
Benz(a)acridine	23B180	Benz(a)acridine
Benz(a)anthracene	21B040	Benz(a)anthracene
Benz(a)anthrene-7(12H)one	07B160	5,6-Benzo-9-anthrone
Benz(a)phenanthrene	21B120	Chrysene
Benz(c)acridine	23B200	Benz(c)acridine
Benz(c)acridine	23B200	Benz(c)acridine
Benz(e)acephenantrylene	22C080	Benzo(b)fluoranthene
1,2-Benz-10-anthrone	07B160	5,6-Benzo-9-anthrone
2,3-Benz-4-azafluorene	23B280	2,3-Benz-4-azafluorene
1,2-Benzacridine	23B180	Benz(a)acridine
3,4-Benzacridine	23B200	Benz(c)acridine
Benzaldehyde	07A140	Benzaldehyde
2,3-Benzanthracene	21B020	Naphthacene
1,2-Benzanthracene	21B040	Benz(a)anthracene
1-Benzazine	23B021	Quinoline
1-Benzazole	23C040	Indole

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
1,2-Benzcarbazole	23C120	Benzo(a)carbazole
Benzene	15A020	Benzene
Benzene carbinol	05A140	Benzyl alcohol
g-Benzene hexachloride	02A380	Hexachlorocyclohexane
Benzene methanol	05A140	Benzyl alcohol
Benzene-trans-hexachloride	02A380	Hexachlorocyclohexane
Benzenecarbinal	07A140	Benzaldehyde
Benzenecarboxylic acid	08A160	Benzoic acid
1,4-Benzenediamine	10C100	1,4-Diaminobenzene
1,2-Benzenedicarboxylic acid	08A200	Phthalic acid
o-Benzenediol	18B020	Catechol
m-Benzenediol	18B040	1,3-Dihydroxybenzene
1,4-Benzenediol	18B060	1,4-Dihydroxybenzene
Benzenesulfonic acid	14A020	Benzenesulfonic acid
Benzenetetrahydride	01B160	Cyclohexene
Benzenethiol	13A100	Benzenethiol
1,2,3-Benzenetriol	18B080	1,2,3-Trihydroxybenzene
8,9-Benzfluoranthene	22C020	Benzo(k)fluoranthene
7,8-Benzfluoranthene	22C040	Benzo(j)fluoranthene
Benzidine	10C140	Benzidine
4,5-Benzindane	22A040	Cyclopentanonaphthalene
2,3-Benzindene	22A020	Fluorene
Benzino form	02A240	Carbon Tetrachloride
Benzo(a)carbazole	23C120	Benzo(a)carbazole
11 H-Benzo(a)carbazole	23C120	Benzo(a)carbazole
Benzo(a)fluorene	22B060	1,2-Benzofluorene
11-HBenzo(a)fluorene	22B060	1,2-Benzofluorene
Benzo(a)pyrene	21C100	Benzo(a)pyrene
Benzo(b)anthracene	21B020	Naphthacene
Benzo(b)fluoranthene	22C080	Benzo(b)fluoranthene
Benzo(b)fluorene	22B020	2,3-Benzofluorene
11-HBenzo(b)fluorene	22B020	2,3-Benzofluorene
Benzo(b)naphtho(1,2-d)thiophene	25B082	Benzo(b)naphtho(1,2-d)thiophene
Benzo(b)naphtho(2,1-d)thiophene	25B083	Benzo(b)naphtho(2,1-d)thiophene
Benzo(b)naphtho(2,3-d)furan	24B060	Benzo(b)naphtho(2,3-d)furan
Benzo(b)naphtho(2,3-d)thiophene	25B081	Benzo(b)naphtho(2,3-d)thiophene
Benzo(b)phenanthrene	21B040	Benz(a)anthracene
Benzo(b)pyridine	23B021	Quinoline
Benzo(b)quinoline	23B080	Acridine
Benzo(b)thiophene	25B040	Benzo(b)thiophene
Benzo(b)triphenylene	21C060	Dibenz(a,c)anthracene
Benzo(c)phenanthrene	21B101	Benzo(c)phenanthrene
Benzo(c)phenanthrene and Alkyl derivatives	21B100	Benzo(c)phenanthrene and Alkyl derivatives
Benzo(c)pyridine	23B022	Isoquinoline
Benzo(c)quinoline	23B120	Phenanthridine
Benzo(def)phenanthrene	21B180	Pyrene
Benzo(e)pyrene	21C120	Benzo(e)pyrene
Benzo(f)quinoline	23B140	Benzo(f)quinoline
Benzo(g)chrysene	21C040	Benzo(g)chrysene
Benzo(ghi)perylene	21D080	Benzo(ghi)perylene
Benzo(h)quinoline	23B160	Benzo(h)quinoline
Benzo(j)fluoranthene	22C040	Benzo(j)fluoranthene
Benzo(j,k)fluorene	22B040	Fluoranthene
Benzo(k)fluoranthene	22C020	Benzo(k)fluoranthene
Benzo(k)xanthene	24B100	1,9-Benzoxanthene
Benzo(rst)pentaphene	21D040	Dibenzo(a,i)pyrene
5,6-Benzo-9-anthrone	07B160	5,6-Benzo-9-anthrone
11,12-Benzofluoranthene	22C020	Benzo(k)fluoranthene
10,11-Benzofluoranthene	22C040	Benzo(j)fluoranthene
2,3-Benzofluoranthene	22C080	Benzo(b)fluoranthene
2,3-Benzofluorene	22B020	2,3-Benzofluorene
1,2-Benzofluorene	22B060	1,2-Benzofluorene
Benzofuran	24A040	Benzofuran
Benzoic acid	08A160	Benzoic acid
Benzoic acid phenyl ester	08D180	Phenyl benzoate
Benzoic aldehyde	07A140	Benzaldehyde

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Benzol	15A020	Benzene
1,2-Benzonaphthacene	21C020	1,2-Benzonaphthacene
Benzonaphthathiophenes	25B080	Benzonaphthathiophenes
Benzonitrile	09B020	Benzonitrile
1,12-Benzoperylene	21D080	Benzo(ghi)perylene
2,3-Benzophenanthrene	21B040	Benz(a)anthracene
1,2-Benzophenanthrene	21B120	Chrysene
9,10-Benzophenanthrene	21B160	Triphenylene
4,5-Benzopyrene	21C120	Benzo(e)pyrene
2,3-Benzopyrrole	23C040	Indole
3,4-Benzoquinoline	23B120	Phenanthridine
5,6-Benzoquinoline	23B140	Benzo(f)quinoline
7,8-Benzoquinoline	23B160	Benzo(h)quinoline
Benzosulfonazole	23D020	Benzothiazole
Benzothiazole	23D020	Benzothiazole
Benzothiofuran	25B040	Benzo(b)thiophene
2,3-Benzothiophene	25B040	Benzo(b)thiophene
1,9-Benzoxanthene	24B100	1,9-Benzoxanthene
Benzoyl alcohol	05A140	Benzyl alcohol
1,2-Benzpyrene	21C100	Benzo(a)pyrene
3,4-Benzpyrene	21C100	Benzo(a)pyrene
1,2-Benzpyrene	21C120	Benzo(e)pyrene
Benzyl alcohol	05A140	Benzyl alcohol
Benzyl carbinol	05A160	Phenethyl alcohol
Benzyl chloride	16B020	a-Chlorotoluene
Betaprone	08B060	b-Propiolactone
Bibenzene	15A160	Biphenyl
Bicyclopentadiene	01B220	Dicyclopentadiene
Bimethyl	01A040	Ethane
Biphenyl	15A160	Biphenyl
4-Biphenylamine	10C120	4-Aminobiphenyl
2,2'-Biphenyldiol	18A120	2,2'-Dihydroxydiphenyl
Biphenylols	18A100	Phenylphenols
Biscyclopentadiene	01B220	Dicyclopentadiene
Bisoflex	08D260	Di-2-ethylhexyl adipate
2,2'-Bithienyl	25B020	2,2'-Bithiophene
2,2'-Bithiophene	25B020	2,2'-Bithiophene
Bivinyl	01B082	1,3-Butadiene
2-Bornanone	07B100	Camphor
Borneo camphor	05B120	Borneol
Borneol	05B120	Borneol
Bornyl alcohol	05B120	Borneol
BPL	08B060	b-Propiolactone
b-Brazan	24B060	Benzo(b)naphtho(2,3-d)furan
1-Bromo-2-chlorobenzene	16A081	1-Bromo-2-chlorobenzene
2-Bromo-2-methylpropane	02A363	2-Bromoisobutane
1-Bromo-3-chlorobenzene	16A082	1-Bromo-3-chlorobenzene
1-Bromo-4-chlorobenzene	16A083	1-Bromo-4-chlorobenzene
Bromobenzene	16A040	Bromobenzene
1-Bromobutane	02A361	1-Bromobutane
2-Bromobutane	02A362	2-Bromobutane
Bromobutanes	02A360	Bromobutanes
Bromochlorobenzenes	16A080	Bromochlorobenzenes
Bromodichloromethane	02A120	Bromodichloromethane
Bromoform	02A160	Bromoform
2-Bromoisobutane	02A363	2-Bromoisobutane
4-Bromophenyl phenyl ether	04A200	4-Bromophenyl phenyl ether
Buta-1,3-diene	01B082	1,3-Butadiene
1,2-Butadiene	01B081	1,2-Butadiene
1,3-Butadiene	01B082	1,3-Butadiene
Butadienes	01B080	Butadienes
Butanal	07A100	Butyraldehyde
n-Butane	01A081	n-Butane
Butanecarboxylic acid	08A080	Valeric acid
1,4-Butanedicarboxylic acid	08A180	Adipic acid
Butanes	01A080	Butanes

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
n-Butanethiol	13A080	n-Butanethiol
1-Butanethiol	13A080	n-Butanethiol
Butanitrile	09A080	Butyronitrile
n-Butanol	05A080	n-Butanol
1-Butanol	05A080	n-Butanol
2-Butanol	05B040	2-Butanol
t-Butanol	05C020	t-Butyl alcohol
Butanone	07B060	Butanone
2-Butanone	07B060	Butanone
1-Butene	01B061	1-Butene
cis-2-Butene	01B062	cis-2-Butene
trans-2-Butene	01B063	trans-2-Butene
cis-Butenedioic acid	08A060	Maleic acid
Butric aldehyde	07A100	Butyraldehyde
Butter or methyl yellow	11A040	p-Dimemthylaminoazobenzene
n-Butyl acetate	08D121	n-Butyl acetate
sec-Butyl acetate	08D122	sec-Butyl acetate
Butyl acetates	08D120	Butyl acetates
Butyl adipate	08D220	Dibutyl adipate
Di-N-butyl adipate	08D220	Dibutyl adipate
Butyl alcohol	05A080	n-Butanol
sec-Butyl alcohol	05B040	2-Butanol
t-Butyl alcohol	05C020	t-Butyl alcohol
n-Butyl aldehyde	07A100	Butyraldehyde
n-Butyl benzene	15A141	n-Butyl benzene
sec-Butyl benzene	15A142	sec-Butyl benzene
sec-Butyl benzene	15A142	sec-Butyl benzene
tert-Butyl benzene	15A143	tert-Butyl benzene
tert-Butyl benzene	15A143	tert-Butyl benzene
Butyl benzenes	15A140	Butyl benzenes
Butyl benzenes	15A140	Butyl benzenes
Butyl benzyl phthalate	08D320	Butyl benzyl phthalate
Butyl ethanoate	08D121	n-Butyl acetate
n-Butyl mercaptan	13A080	n-Butanethiol
Di-n-butyl phthalate	08D283	Di-n-butyl Phthalate
n-Butylamine	10A141	1-Aminobutane
Butylamines	10A140	Butylamines
n-Butylbromide	02A361	1-Bromobutane
sec-Butylbromide	02A362	2-Bromobutane
tert-Butylbromide	02A363	2-Bromoisobutane
a-Butylene	01B061	1-Butene
cis-B-Butylene	01B062	cis-2-Butene
trans-B-Butylene	01B063	trans-2-Butene
Butylenes	01B060	Butylenes
Butylethylene	01B141	1-Hexene
n-Butylthioalcohol	13A080	n-Butanethiol
1-Butyne	01C061	1-Butyne
2-Butyne	01C062	2-Butyne
Butynes	01C060	Butynes
Butyraldehyde	07A100	Butyraldehyde
g-Butyrolactone	08B080	g-Butyrolactone
4-Butyrolactone	08B080	g-Butyrolactone
Butyronitrile	09A080	Butyronitrile
C-56	02B140	Hexachlorocyclopentadiene
a,b-Camphol	05B140	Isoborneol
d-2-Camphonone	07B100	Camphor
2-Camphonone	07B100	Camphor
Camphor	07B100	Camphor
Capric acid	08A103	Capric acid
Caproic acid	08A101	Caproic acid
e-Caprolactam	08C060	6-Hexanelactam
Caprylic acid	08A102	Caprylic acid
Carbazine	23B100	Dihydroacridine
Carbazole	23C080	Carbazole
Carbinol	05A020	Methanol
Carbolic acid	18A020	Phenol

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Carbon bichloride	02B080	Tetrachloroethene
Carbon dichloride	02B080	Tetrachloroethene
Carbon hexachloride	02A320	Hexachloroethane
Carbon tetrachloride	02A240	Carbon tetrachloride
Carvol	07B181	Carvone (d or l)
Carvone (d or l)	07B181	Carvone (d or l)
Carvones	07B180	Carvones
Catechol	18B020	Catechol
Cetylic acid	08A122	Palmitic acid
Chinoline	23B021	Quinoline
Chlorinated cresols	19B020	Chlorinated cresols
Chlorinated-m-cresol	19B022	Chlorinated m-cresol
Chlorinated-o-cresol	19B021	Chlorinated o-cresol
Chlorinated-p-cresol	19B023	Chlorinated p-cresol
bis-(2-Chloro-1-methylethyl)ether	04B100	2,2'-Dichlorodiisopropyl ether
2-Chloro-1,2-epoxypropane	04A040	2-Chloro-1,2-epoxypropane
1-Chloro-1,2-oxetane	04A060	1-Chloro-1,3-epoxypropane
1-Chloro-1,3-epoxypropane	04A060	1-Chloro-1,3-epoxypropane
4-Chloro-2-hydroxy benzophenone	07C04A	4-Chloro-2-hydroxy benzophenone
4-Chloro-2'-hydroxy benzophenone	07C04B	4-Chloro-2'-hydroxy benzophenone
5-Chloro-2-hydroxy benzophenone	07C04E	5-Chloro-2-hydroxy benzophenone
2-Chloro-2'-hydroxy benzophenone	07C041	2-Chloro-2'-hydroxy benzophenone
3-Chloro-2'-hydroxy benzophenone	07C045	3-Chloro-2'-hydroxy benzophenone
3-Chloro-2-hydroxy benzophenone	07C046	3-Chloro-2-hydroxy benzophenone
1-Chloro-2-nitrobenzene	17B040	1-Chloro-2-nitrobenzene
1-Chloro-2,3-epoxypropane	04A050	Epichlorhydrin
4-Chloro-3'-hydroxy benzophenone	07C04C	4-Chloro-3'-hydroxy benzophenons
2-Chloro-3'-hydroxy benzophenone	07C042	2-Chloro-3'-hydroxy benzophenonen
3-Chloro-3'-hydroxy benzophenone	07C047	3-Chloro-3'-hydroxy benzophenone
4-Chloro-4'-hydroxy benzophenone	07C04D	4-Chloro-4'-hydroxy benzophenone
2-Chloro-4'-hydroxy benzophenone	07C043	2-Chloro-4'-hydroxy benzophenone
3-Chloro-4'-hydroxy benzophenone	07C048	3-Chloro-4'-hydroxy benzophenone
3-Chloro-4-hydroxy benzophenone	07C049	3-Chloro-4-hydroxy benzophenone
1-Chloro-4-nitrobenzene	17B060	1-Chloro-4-nitrobenzene
2-Chloro-5-hydroxy benzophenone	07C044	2-Chloro-5-hydroxy benzophenone
a-Chloroallychloride	02B103	cis-1,3-Dichloropropene
Chlorobenzene	16A020	Chlorobenzene
a-Chlorobutyl ethyl ether	04A160	a-Chlorobutyl ethyl ether
Chlorodibromomethane	02A140	Dibromochloromethane
2-Chlorodiethyl ether	04A120	2-Chloroethyl ethyl ether
Chloroethane	02A250	Ethyl chloride
Chloroethene	02B020	Vinyl chloride
Chloroethyl	02A250	Ethyl chloride
2-Chloroethyl ethyl ether	04A120	2-Chloroethyl ethyl ether
2-Chloroethyl vinyl ether	04A140	2-Chloroethyl vinyl ether
bis-(2-Chloroethyl)ether	04B080	2,2'-Dichlorodiethyl ether
Chloroethylene	02B020	Vinyl chloride
2-Chloroethylmethyl ether	04A080	2-Chloroethylmethyl ether
Chloroform	02A100	Chloroform
Chlorohydroxy benzophenones	07C040	Chlorohydroxy benzophenones
Chlorohydroxytoluenes	19B020	Chlorinated cresols
bis(a-Chloroisopropyl)ether	04B100	2,2'-Dichlorodiisopropyl ether
Chloromethane	02A040	Methyl chloride
Chloromethyl ethyl ether	04A100	Chloromethyl ethyl ether
Chloromethyl methyl ether	04A020	Chloromethyl methyl ether
(Chloromethyl)benzene	16B020	a-Chlorotoluene
1,2-bis(Chloromethyl)benzene	16B041	1,2-bis (Chloromethyl) benzene
1,3-bis(Chloromethyl)benzene	16B042	1,3-bis (Chloromethyl) benzene
1,4-bis(Chloromethyl)benzene	16B043	1,4-bis (Chloromethyl) benzene
bis (Chloromethyl)benzenes	16B040	bis (Chloromethyl) benzenes
bis(Chloromethyl)ether	04B020	1,1'-Dichloromethyl ether
Chloromethyloxirane	04A050	Epichlorhydrin
1-Chloronaphthalene	16A201	1-Chloronaphthalene
a-Chloronaphthalene	16A201	1-Chloronaphthalene
2-Chloronaphthalene	16A202	2-Chloronaphthalene
b-Chloronaphthalene	16A202	2-Chloronaphthalene

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Chloronaphthalenes	16A200	Chloronaphthalenes
o-Chloronitrobenzene	17B040	1-Chloro-2-nitrobenzene
p-Chloronitrobenzene	17B060	1-Chloro-4-nitrobenzene
1-Chlorooctane	02A400	1-Chlorooctane
Chlorophen	19A060	Pentachlorophenol
2-Chlorophenol	19A020	2-Chlorophenol
o-Chlorophenol	19A020	2-Chlorophenol
4-Chlorophenyl phenyl ether	04A180	4-Chlorophenyl phenyl ether
g-Chloropropylene oxide	04A050	Epichlorhydrin
2-Chloropyridine	23A101	2-Chloropyridine
3-Chloropyridine	23A102	3-Chloropyridine
4-Chloropyridine	23A103	4-Chloropyridine
Chloropyridines	23A100	Chloropyridines
Chlorothene	02A280	Trichloroethane
2-Chlorotoluene	16A180	2-Chlorotoluene
o-Chlorotoluene	16A180	2-Chlorotoluene
a-Chlorotoluene	16B020	a-Chlorotoluene
Chlorten	02A280	Trichloroethane
Chrysene	21B120	Chrysene
a-Chrysidine	23B200	Benz(c)acridine
a-Chrysidine	23B200	Benz(c)acridine
Chrysofluorene	22B060	1,2-Benzofluorene
Chrysogen	21B020	Napthacene
CMME	04A020	Chloromethyl methyl ether
2,4,6-Collidine	23A122	2,4,6-Collidine
Collidines	23A120	Collidines
Coronene	21D100	Coronene
Coumarone	24A040	Benzofuran
m-Cresol	18A041	m-Cresol
o-Cresol	18A042	o-Cresol
p-Cresol	18A043	p-Cresol
Cresols	18A040	Cresols
Cresylic acid	18A040	Cresols
Crotonylene	01C062	2-Butyne
Cumarone	24A040	Benzofuran
Cumeme	15A120	Isopropyl benzene
Cyanobenzene.	09B020	Benzonitrile
1-Cyanoethane	09A060	1-Cyanoethane
Cyanoethylene	09A040	Acrylonitrile
1-Cyanonaphthalene	09B041	a-Naphthonitrile
2-Cyanonaphthalene	09B042	b-Naphthonitrile
Cyanonaphthalenes	09B040	Naphthonitriles
Cyanopropane	09A080	Butyronitrile
1,3-Cyclohexadiene	01B181	1,3-Cyclohexadiene
1,4-Cyclohexadiene	01B182	1,4-Cyclohexadiene
Cyclohexadienes	01B180	Cyclohexadienes
Cyclohexane	01A160	Cyclohexane
Cyclohexene	01B160	Cyclohexene
Cyclohexylamine	10A160	Cyclohexylamine
Cyclopenta(def)phenanthrene	22B080	Cyclopenta(def)phenanthrene
4H-Cyclopenta(def)phenanthrene	22B080	Cyclopenta(def)phenanthrene
Cyclopentadiene	01B120	Cyclopentadiene
1,3-Cyclopentadiene	01B120	Cyclopentadiene
1,3-Cyclopentadiene dimer	01B220	Dicyclopentadiene
Cyclopentane	01A120	Cyclopentane
1,2-Cyclopentanonaphthalene	22A040	Cyclopentanonaphthalene
Cyclopentanonaphthalene	22A040	Cyclopentanonaphthalene
Cyclotetramethylene oxide	03A060	Tetrahydrofuran
b-Cytisolidine	23B065	6,8-Dimethylquinoline
DB(a,h)A	21C080	Dibenz(a,h)anthracene
DB(a,h)P	21D020	Dibenzo(a,h)pyrene
n-Decane	01A241	n-Decane
n-Decanoic acid	08A103	Capric acid
n-Decoic acid	08A103	Capric acid
Decylhydride	01A241	n-Decane
2,6-Di-sec-butyl phenol	18A182	2,6-Di-sec-butyl phenol

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
1,4-Di-tert-butyl benzene	15B106	1,4-Di-tert-butyl benzene
Di-2-ethylbutyl adipate	08D240	Di-2-ethylbutyl adipate
Di-2-ethylhexyl adipate	08D260	Di-2-ethylhexyl adipate
Di-2-ethylhexyl phthalate	08D300	Di-2-ethylhexyl phthalate
Dialkyl benzenes (MW:134-191)	15B100	Dialkyl benzenes (MW:134-191)
4,4'-Diamino-3,3'-dichlorobiphenyl	10C160	3,3'-Dichlorobenzidine
1,4-Diaminobenzene	10C100	1,4-Diaminobenzene
p-Diaminobenzene	10C100	1,4-Diaminobenzene
4,4'-Diaminodiphenyl	10C140	Benzidine
1,2-Diaminoethane	10A080	1,2-Diaminoethane
Diazirine	11A020	Diazomethane
Diazomethane	11A020	Diazomethane
Dibenz(a,c)anthracene	21C060	Dibenz(a,c)anthracene
Dibenz(a,h)acridine	23B240	Dibenz(a,h)acridine
Dibenz(a,h)anthracene	21C080	Dibenz(a,h)anthracene
Dibenz(a,j)acridine	23B220	Dibenz(a,j)acridine
Dibenz(a,j)anthracene	21C020	1,2-Benzonaphthacene
Dibenz(b,d)pyrrole	23C080	Carbazole
Dibenz(c,h)acridine	23B260	Dibenz(c,h)acridine
Dibenz(de,kl)anthracene	21C140	Perylene
1,2:7,8-Dibenzacridine	23B220	Dibenz(a,j)acridine
1,2:5,6-Dibenzacridine	23B240	Dibenz(a,h)acridine
3,4:5,6-Dibenzacridine	23B260	Dibenz(c,h)acridine
1,2:6,7-Dibenzanthracene	21C020	1,2-Benzonaphthacene
1,2:3,4-Dibenzanthracene	21C060	Dibenz(a,c)anthracene
1,2:5,6-Dibenzanthracene	21C080	Dibenz(a,h)anthracene
1,2:3,4-Dibenznaphthalene	21B160	Triphenylene
Dibenzo(a,g)carbazole	23C180	Dibenzo(a,g)carbazole
7H-Dibenzo(a,g)carbazole	23C180	Dibenzo(a,g)carbazole
13H-Dibenzo(a,g)fluorene	22C060	1,2:5,6-Dibenzo fluorene
Dibenzo(a,h)pyrene	21D020	Dibenzo(a,h)pyrene
Dibenzo(a,i)carbazole	23C140	Dibenzo(a,i)carbazole
7H-Dibenzo(a,i)carbazole	23C140	Dibenzo(a,i)carbazole
Dibenzo(a,i)phenanthrene	21C160	Picene
Dibenzo(a,i)pyrene	21D040	Dibenzo(a,i)pyrene
Dibenzo(a,l)pyrene	21D060	Dibenzo(a,l)pyrene
Dibenzo(b,def)chrysene	21D020	Dibenzo(a,h)pyrene
Dibenzo(b,e)pyridine	23B080	Acridine
Dibenzo(c,g)carbazole	23C160	Dibenzo(c,g)carbazole
7H-Dibenzo(c,g)carbazole	23C160	Dibenzo(c,g)carbazole
Dibenzo(def,p)chrysene	21D060	Dibenzo(a,l)pyrene
1,2:7,8-Dibenzocarbazole	23C140	Dibenzo(a,i)carbazole
3,4:5,6-Dibenzocarbazole	23C160	Dibenzo(c,g)carbazole
1,2:5,6-Dibenzocarbazole	23C180	Dibenzo(a,g)carbazole
1,2:5,6-Dibenzofluorene	22C060	1,2:5,6-Dibenzofluorene
Dibenzofuran	24B020	Dibenzofuran
1,2:3,4-Dibenzophenanthrene	21C040	Benzo(g)chrysene
1,2:9,10-Dibenzopyrene	21D060	Dibenzo(a,l)pyrene
Dibenzothiophene	25B060	Dibenzothiophene
1,2:7,8-Dibenzphenanthrene	21C160	Picene
1,2:6,7-Dibenzpyrene	21D020	Dibenzo(a,h)pyrene
3,4:8,9-Dibenzpyrene	21D020	Dibenzo(a,h)pyrene
2,3:6,7-Dibenzpyrene	21D040	Dibenzo(a,i)pyrene
4,5:8,9-Dibenzpyrene	21D040	Dibenzo(a,i)pyrene
1,2:3,4-Dibenzpyrene	21D060	Dibenzo(a,l)pyrene
2,3:4,5-Dibenzpyrene	21D060	Dibenzo(a,l)pyrene
1,2-Dibromobenzene	16A061	1,2-Dibromobenzene
1,3-Dibromobenzene	16A062	1,3-Dibromobenzene
1,4-Dibromobenzene	16A063	1,4-Dibromobenzene
Dibromobenzenes	16A060	Dibromobenzenes
Dibromochloromethane	02A140	Dibromochloromethane
Dibromodichloromethane	02A180	Dibromodichloromethane
Dibutyl adipate	08D220	Dibutyl adipate
1,1-Dichloro-2,2-difluoroethene	02B090	1,1-Dichloro-2,2-difluoroethylene
1,1-Dichloro-2,2-difluoroethylene	02B090	1,1-Dichloro-2,2-difluoroethylene
3,3'-Dichloro-4,4'-biphenyldiamine	10C160	3,3'-Dichlorobenzidine

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
3,3'-Dichloro-4,4'-diaminobiphenyl	10C160	3,3'-Dichlorobenzidine
3,3'Dichloro-4,4'-diaminodiphenyl methane	10C180	4,4'-Methylene bis(2-chloroaniline)
1,2-Dichlorobenzene	16A100	1,2-Dichlorobenzene
o-Dichlorobenzene	16A100	1,2-Dichlorobenzene
1,3-Dichlorobenzene	16A120	1,3-Dichlorobenzene
m-Dichlorobenzene	16A120	1,3-Dichlorobenzene
1,4-Dichlorobenzene	16A140	1,4-Dichlorobenzene
p-Dichlorobenzene	16A140	1,4-Dichlorobenzene
3,3'-Dichlorobenzidine	10C160	3,3'-Dichlorobenzidine
o,o'-Dichlorobenzidine	10C160	3,3'-Dichlorobenzidine
Dichlorobromomethane	02A120	Bromodichloromethane
1,1'-Dichlorodiethyl ether	04B040	1,1'-Dichlorodiethyl ether
2,2'-Dichlorodiethyl ether	04B080	2,2'-Dichlorodiethyl ether
Dichlorodifluoromethane	02A200	Dichlorodifluoromethane
1,2-Dichlorodiisobutyl ether	04B120	1,2-Dichlorodiisobutyl ether
2,2'-Dichlorodiisopropyl ether	04B100	2,2'-Dichlorodiisopropyl ether
1,2-Dichloroethane	02A260	1,2-Dichloroethane
1,2-Dichloroethene	02B040	1,2-Dichloroethene
cis-1,2-Dichloroethene	02B041	cis-1,2-Dichloroethene
trans-1,2-Dichloroethene	02B042	trans-1,2-Dichloroethene
1,1-Dichloroethene	02B060	1,1-Dichloroethene
1,2-Dichloroethyl ethyl ether	04B060	1,2-Dichloroethyl ethyl ether
Dichloroethylene	02B040	1,2-Dichloroethene
1,1-Dichloroethylene	02B060	1,1-Dichloroethene
Dichloromethane	02A080	Methylene chloride
1,1'-Dichloromethyl ether	04B020	1,1'-Dichloromethyl ether
2,4-Dichlorophenol	19A040	2,4-Dichlorophenol
1,1-Dichloropropane	02A341	1,1-Dichloropropane
1,2-Dichloropropane	02A342	1,2-Dichloropropane
1,3-Dichloropropane	02A343	1,3-Dichloropropane
2,2-Dichloropropane	02A344	2,2-Dichloropropane
Dichloropropanes	02A340	Dichloropropanes
1,1-Dichloropropene	02B101	1,1-Dichloropropene
trans-1,2-Dichloropropene	02B102	trans-1,2-Dichloropropene
cis-1,3-Dichloropropene	02B103	cis-1,3-Dichloropropene
trans-1,3-Dichloropropene	02B104	trans-1,3-Dichloropropene
2,3-Dichloropropene	02B105	2,3-Dichloropropene
3,3-Dichloropropene	02B106	3,3-Dichloropropene
Dichloropropenes	02B100	Dichloropropenes
1,2-Dichloropropylene	02B102	trans-1,2-Dichloropropene
a,g-Dichloropropylene	02B103	cis-1,3-Dichloropropene
1,3-Dichloropropylene	02B103	cis-1,3-Dichloropropene
1,3-Dicyano-1-hydroxybutane	09A100	1,3-Dicyano-1-hydroxybutane
Dicyclopentadiene	01B220	Dicyclopentadiene
Diethamine	10B080	Diethylamine
Diethyl adipate	08D200	Diethyl adipate
o-Diethyl benzene	15B101	o-Diethyl benzene
m-Diethyl benzene	15B102	m-Diethyl benzene
p-Diethyl benzene	15B103	p-Diethyl benzene
Diethyl carbinol	05B062	3-Pentanol
Diethyl hexyl phthalate	08D300	Di-2-ethylhexyl phthalate
Diethyl phthalate	08D282	Diethyl phthalate
Diethyl sulfide	13B040	Diethyl sulfide
Diethylamine	10B080	Diethylamine
1,4-Diethylene dioxide	03B020	1,4-Dioxane
Diethylene imidoxide	10B100	Morpholine
Diethylene oximide	10B100	Morpholine
Diethyleneimide oxide	10B100	Morpholine
Diethylnitrosoamine	12A040	N-Nitrosodiethylamine
1,1-Difluoro-2,2-dichloroethylene	02B090	1,1-Dichloro-2,2-difluoroethylene
Difluorodichloromethane	02A200	Dichlorodifluoromethane
Dihexyl	01A260	n-Dodecane
Dihydro-(d or 1)carvone	07B182	Dihydro-(d or 1) carvone
Dihydro-2(3H)-furanone	08B080	g-Butyrolactone
1,2-Dihydro-3-methylbenz(j)aceanthrylene	21B080	3-Methylcholanthrene
1,2-Dihydroacenaphthylene	21A100	Acenaphthene

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Dihydroacridine	23B100	Dihydroacridine
1,4-Dihydrobenzene	01B182	1,4-Cyclohexadiene
1,2-Dihydrobenzene	01B181	1,3-Cyclohexadiene
2,3-Dihydroindene	15B020	Indan
1,2-Dihydronaphthalene	15B141	1,2-Dihydronaphthalene
1,4-Dihydronaphthalene	15B142	1,4-Dihydronaphthalene
Dihydronaphthalenes	15B140	Dihydronaphthalenes
o-Dihydroxybenzene	18B020	Catechol
1,2-Dihydroxybenzene	18B020	Catechol
1,3-Dihydroxybenzene	18B040	1,3-Dihydroxybenzene
m-Dihydroxybenzene	18B040	1,3-Dihydroxybenzene
1,4-Dihydroxybenzene	18B060	1,4-Dihydroxybenzene
p-Dihydroxybenzene	18B060	1,4-Dihydroxybenzene
2,2'-Dihydroxydiphenyl	18A120	2,2'-Dihydroxydiphenyl
1,2-Dihydroxyethane	06A020	Ethylene glycol
1,2-Dihydroxypropane	06A040	Propylene glycol
Diisobutyl carbinol	05B080	2,6-Dimethyl-4-heptanol
o-Diisopropyl benzene	15B104	o-Diisopropyl benzene
m-Diisopropyl benzene	15B105	m-Diisopropyl benzene
Diisopropyl ether	03A020	Isopropyl ether
Dimazine	11B040	N,N-Dimethylhydrazine
3,4-diMe-thiophene	25A064	3,4-Dimethylthiophene
Dimethyl	01A040	Ethane
2,3-Dimethyl aniline	10C061	2,3-Xylidine
2,4-Dimethyl aniline	10C062	2,4-Xylidine
2,5-Dimethyl aniline	10C063	2,5-Xylidine
2,6-Dimethyl aniline	10C064	2,6-Xylidine
3,4-Dimethyl aniline	10C065	3,4-Xylidine
3,5-Dimethyl aniline	10C066	3,5-Xylidine
Dimethyl chloroether	04A020	Chloromethyl methyl ether
Dimethyl disulfide	13B080	Methyldisulfide
Dimethyl ethyl carbinol	05C040	t-Pentanol
2,6-Dimethyl heptan-4-ol	05B080	2,6-Dimethyl-4-heptanol
1,4-Dimethyl naphthalene	21A081	1,4-Dimethyl naphthalene
2,3-Dimethyl naphthalene	21A082	2,3-Dimethyl naphthalene
2,6-Dimethyl naphthalene	21A083	2,6-Dimethyl napthalene
Dimethyl naphthalenes	21A080	Dimethyl naphthalenes
Dimethyl phthalate	08D281	Dimethyl phthalate
3,4-Dimethyl pyrene	21B221	3,4-Dimethyl pyrene
4,5-Dimethyl pyrene	21B222	4,5-Dimethyl pyrene
Dimethyl pyrenes	21B220	Dimethyl pyrenes
Dimethyl sulfide	13B020	Dimethyl sulfide
Dimethyl sulfoxide	14B020	Dimethyl sulfoxide
2,4-Dimethyl-1-hydroxy benzene	18A142	2,4-Xylenol
2,2-Dimethyl-1-propanol	05A123	2,2-Dimethyl-1-propanol
9,10-Dimethyl-1,2-benzanthracene	21B060	7,12-Dimethylbenz(a)anthracene
1,4-Dimethyl-2-hydroxy benzene	18A143	2,5-Xylenol
1,3-Dimethyl-2-hydroxy benzene	18A144	2,6-Xylenol
1,2-Dimethyl-3-hydroxy benzene	18A141	2,3-Xylenol
N,N-Dimethyl-4-(phenylazo)benzenamine	11A040	p-Dimethylaminoazobenzene
2,6-Dimethyl-4-heptanol	05B080	2,6-Dimethyl-4-heptanol
2,6-Dimethyl-4-heptyl phenol	18A183	2,6-Dimethyl-4-heptyl phenol
1,2-Dimethyl-4-hydroxy benzene	18A146	3,4-Xylenol
1,3-Dimethyl-5-hydroxy benzene	18A145	3,5-Xylenol
Dimethylacetylene	01C062	2-Butyne
Dimethylamine	10B040	Dimethylamine
p-Dimethylaminoazobenzene	11A040	p-Dimethylaminoazobenzene
4-Dimethylaminoazobenzene	11A040	p-Dimethylaminoazobenzene
N,N-Dimethylaniline	10D020	N,N-Dimethylaniline
Dimethylanilines	10C060	Dimethylanilines
2,7-Dimethylanthracene	21A160	2,7-Dimethylanthracene
7,12-Dimethylbenz(a)anthracene	21B060	7,12-Dimethylbenz(a)anthracene
Dimethylbenzene	15B080	Xylenes
Dimethylenediamine	10A080	1,2-Diaminoethane
(1,1-Dimethylethyl)benzene	15A143	tert-Butyl benzene
(1,1-Dimethylethyl)benzene	15A143	tert-Butyl benzene

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Dimethylethylene	01B062	cis-2-Butene
N,N-Dimethylhydrazine	11B040	N,N-Dimethylhydrazine
1,1-Dimethylhydrazine	11B040	N,N-Dimethylhydrazine
N,N'-Dimethylhydrazine	11B060	N,N'-Dimethylhydrazine
1,2-Dimethylhydrazine	11B060	N,N'-Dimethylhydrazine
Dimethylhydrazine	11B060	N,N'-Dimethylhydrazine
Dimethylhydroxybenzenes	18A140	Xylenols
1,3-Dimethylisoquinoline	23B066	1,3-Dimethylisoquinoline
1,5-Dimethylisquinoline	23B067	1,5-Dimethylisoquinoline
Dimethylketone	07B020	Acetone
Dimethylmethane	01A060	Propane
a-Dimethylnapthalene	21A081	1,4-Dimethyl naphthalene
Dimethylnitrosoamine	12A020	N-Nitrosodimethylamine
2,3-Dimethylphenol	18A141	2,3-Xylenol
2,4-Dimethylphenol	18A142	2,4-Xylenol
2,5-Dimethylphenol	18A143	2,5-Xylenol
2,6-Dimethylphenol	18A144	2,6-Xylenol
3,5-Dimethylphenol	18A145	3,5-Xylenol
3,4-Dimethylphenol	18A146	3,4-Xylenol
Dimethylphenols	18A140	Xylenols
Dimethylphenylamine	10D020	N,N-Dimethylaniline
2,2-Dimethylpropane	01A103	Neopentane
2,3-Dimethylpyridine	23A141	2,3-Dimethylpyridine
2,4-Dimethylpyridine	23A142	2,4-Dimethylpyridine
2,5-Dimethylpyridine	23A143	2,5-Dimethylpyridine
2,6-Dimethylpyridine	23A144	2,6-Dimethylpyridine
3,4-Dimethylpyridine	23A145	3,4-Dimethylpyridine
2,3-Dimethylquinoline	23B061	2,3-Dimethylquinoline
2,6-Dimethylquinoline	23B062	2,6-Dimethylquinoline
2,8-Dimethylquinoline	23B063	2,8-Dimethylquinoline
3,4-Dimethylquinoline	23B064	3,4-Dimethylquinoline
6,8-Dimethylquinoline	23B065	6,8-Dimethylquinoline
Dimethylquinolines and dimethylisoquinolines	23B060	Dimethyquinolines and dimethylisoquinolines
2,3-Dimethylthiophene	25A061	2,3-Dimethylthiophene
2,4-Dimethylthiophene	25A062	2,4-Dimethylthiophene
2,5-Dimethylthiophene	25A063	2,5-Dimethylthiophene
3,4-Dimethylthiophene	25A064	3,4-Dimethylthiophene
Dimethylthiophenes	25A060	Dimethylthiophenes
peri-Dinaphthalene	21C140	Perylene
4,6-Dinitro-o-cresol	20B020	4,6-Dinitro-o-cresol
2,4-Dinitro-o-cresol	20B020	4,6-Dintro-o-cresol
3,5-Dinitro-p-cresol	20B041	3,5-Dinitro-p-cresol
2,6-Dinitro-p-cresol	20B042	2,6-Dinitro-p-cresol
Dinitro-p-cresols	20B040	Dinitro-p-cresols
3,5-Dinitro-2-hydroxy toluene	20B020	4,6-Dinitro-o-cresol
Dinitroaminophenol	20A080	2-Amino-4,6-dinitrophenol
Dinitrohydroxybenzenes	20A100	Dinitrophenols
2,4-Dinitrophenol	20A101	2,4-Dinitrophenol
2,5-Dinitrophenol	20A102	2,5-Dinitrophenol
2,6-Dinitrophenol	20A103	2,6-Dinitrophenol
Dinitrophenols	20A100	Dinitrophenols
2,6-Dinitrotoluene	17A081	2,6-Dinitrotoluene
3,4-Dinitrotoluene	17A082	3,4-Dinitrotoluene
2,3-Dinitrotoluene	17A083	2,3-Dinitrotoluene
2,4-Dinitrotoluene	17A084	2,4-Dinitrotoluene
2,5-Dinitrotoluene	17A085	2,5-Dinitrotoluene
3,5-Dinitrotoluene	17A086	3,5-Dinitrotoluene
Dinitrotoluenes	17A080	Dinitrotoluenes
Dioctylester o-benzenedicarboxylic acid	08D300	Di-2-ethylhexyl phthalate
Dioctylester phthalic acid	08D300	Di-2-ethylhexyl phthalate
1,4-Dioxane	03B020	1,4-Dioxane
p-Dioxane	03B020	1,4-Dioxane
1,3-Dioxane	03B040	1,3-Dioxane
Dipentylnitrosamine	12A100	N-Nitrosodipentylamine
Diphenyl	15A160	Biphenyl
Diphenyl sulfide	13B060	Diphenyl sulfide

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Diphenyl thioether	13B060	Diphenyl sulfide
1,2-Diphenylbenzene	15B161	o-Terphenyl
1,3-Diphenylbenzene	15B162	m-Terphenyl
1,4-Diphenylbenzene	15B163	p-Terphenyl
4,4'-Diphenylbiphenyl	15B060	4,4'-Diphenylbiphenyl
Diphenylene oxide	24B020	Dibenzofuran
Diphenylene sulfide	25B060	Dibenzothiophene
4-4'-Diphenylenediamine	10C140	Benzidine
Diphenyleneimine	23C080	Carbazole
Diphenylenemethane	22A020	Fluorene
1,2-Diphenylhydrazine	11B080	1,2-Diphenylhydrazine
Diphenylnitrosamine	12B040	N-Nitrosodiphenylamine
Dipropyl	01A141	n-Hexane
Dipropyl methane	01A181	n-Heptane
Disubstituted, polysubstituted alkyl pyridines	23A140	Disubstituted, polysubstituted alkyl pyridines
Divinyl	01B082	1,3-Butadiene
Divinylene oxide	24A020	Furan
Divinyleneimene	23C020	Pyrrole
DMBA	21B060	7,12-Dimethylbenz(a)anthracene
DMSO	14B020	Dimethyl sulfoxide
n-Dodecane	01A260	n-Dodecane
Dodecanoic acid	08A104	Lauric acid
Dodecylene	01A260	n-Dodecane
Durene	15B203	1,2,4,5-Tetramethylbenzene
Endo-1,7,7-trimethyl bicyclo[2.2.1]heptan-2-ol	05B120	Borneol
Endo-2-bornanol	05B120	Borneol
Endo-2-camphanol	05B120	Borneol
Endo-2-hydroxy camphane	05B120	Borneol
Epichlorhydrin	04A050	Epichlorhydrin
Epihydrin alcohol	06B020	2,3-Epoxy-1-propanol
2,3-Epoxy-1-propanol	06B020	2,3-Epoxy-1-propanol
1,4-Epoxybutane	03A060	Tetrahydrofuran
Erythrene	01B082	1,3-Butadiene
Ethanal	07A040	Acetaldehyde
Ethanamide	08C040	Acetamide
Ethanamine	10A040	Ethylamine
Ethane	01A040	Ethane
1,2-Ethanediamine	10A080	1,2-Diaminoethane
1,2-Ethanediol	06A020	Ethylene glycol
Ethanenitrile	09A020	Acetonitrile
Ethanethiol	13A040	Ethanethiol
Ethanoic acid	08A040	Acetic acid
Ethanol	05A040	Ethanol
Ethanolamine	10A060	Ethanolamine
Ethene	01B020	Ethylene
Ethenylbenezene	15A080	Styrene
Ethine	01C020	Acetylene
Ethyl acetate	08D040	Ethyl acetate
Ethyl acrylate	08D060	Ethyl acrylate
Ethyl adipate	08D200	Diethyl adipate
Ethyl alcohol	05A040	Ethanol
Ethyl aldehyde	07A040	Acetaldehyde
Ethyl benzene	15A060	Ethyl benzene
Ethyl benzol	15A060	Ethyl benzene
Ethyl chloride	02A250	Ethyl chloride
Ethyl cresols	18A160	Ethyl cresols
Ethyl cyanate	09A060	1-Cyanoethane
Ethyl cyanide	09A060	1-Cyanoethane
Ethyl d-carboethoxyvalerate	08D200	Diethyl adipate
Ethyl hydride	01A040	Ethane
Ethyl mercaptan	13A040	Ethanethiol
Ethyl methyl pyridines	23A120	Collidines
Ethyl methylphenols	18A160	Ethyl cresols
1-Ethyl naphthalene	21A043	1-Ethyl naphthalene
2-Ethyl naphthalene	21A044	2-Ethyl naphthalene
Ethyl phosphate	26A020	Triethyl phosphate

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Ethyl propenoate	08D060	Ethyl acrylate
Ethyl thioalcohol	13A040	Ethanethiol
2-Ethyl-benzo(c)phenanthrene	21B108	2-Ethyl-benzo(c)phenanthrene
6-Ethyl-benzo(c)phenanthrene	21B109	6-Ethyl-benzo(c)phenanthrene
N-Ethyl-ethanamine	10B080	Diethylamine
6-Ethyl-m-cresol	18A161	6-Ethyl-m-cresol
4-Ethyl-o-cresol	18A162	4-Ethyl-o-cresol
2-Ethyl-p-cresol	18A163	2-Ethyl-p-cresol
6-Ethyl-2-methyl phenol	18A161	6-Ethyl-m-cresol
5-Ethyl-2-methylpyridine	23A121	5-Ethyl-2-methylpyridine
4-Ethyl-3-methyl phenol	18A162	4-Ethyl-o-cresol
2-Ethyl-4-methyl phenol	18A163	2-Ethyl-p-cresol
2-Ethyl-4-methyl-1,3-dioxolane	03B060	2-Ethyl-4-methyl-1,3-dioxolane
3-Ethyl-6-methylpyridine	23A121	5-Ethyl-2-methylpyridine
Ethylacetylene	01C061	1-Butyne
Ethylamine	10A040	Ethylamine
bis-2-Ethylbutyl adipic acid ester	08D240	Di-2-ethylbutyl adipate
Ethyldimethylmethane	01A102	Isopentane
Ethylene	01B020	Ethylene
Ethylene chloride	02A260	1-2-Dichloroethane
Ethylene dichloride	02A260	1,2-Dichloroethane
Ethylene glycol	06A020	Ethylene glycol
Ethylene tetrachloride	02B080	Tetrachloroethene
Ethylenediamine	10A080	1,2-Diaminoethane
1,2-Ethylenedicarboxylic acid	08A060	Maleic acid
cis-1,2-Ethylenedicarboxylic acid	08A060	Maleic acid
Ethyleneimine	10B020	Ethyleneimine
1,8-Ethylenenaphthalene	21A100	Acenaphthene
E-Ethylethanamine	10B080	Diethylamine
Ethylethylene	01B061	1-Butene
bis(2-Ethylhexyl)adipate	08D260	Di-2-ethylhexyl adipate
Ethylhydroxy benzenes	18A080	Ethylphenols
Ethylisobutylmethane	01A182	Isoheptane
Ethylmethyl acetaldehyde	07A121	2-Methylbutanal
Ethylmethylamine	10B060	Ethylmethylamine
o-Ethylphenol	18A081	o-Ethylphenol
2-Ethylphenol	18A081	o-Ethylphenol
m-Ethylphenol	18A082	m-Ethylphenol
3-Ethylphenol	18A082	m-Ethylphenol
p-Ethylphenol	18A083	p-Ethylphenol
4-Ethylphenol	18A083	p-Ethylphenol
Ethylphenols	18A080	Ethylphenols
2-Ethylpyridine	23A061	2-Ethylpyridine
3-Ethylpyridine	23A062	3-Ethylpyridine
4-Ethylpyridine	23A063	4-Ethylpyridine
Ethylsulfide	13B040	Diethyl sulfide
Ethyne	01C020	Acetylene
Exo-1,7,7-trimethyl-bicyclo [2.2.2]heptan-2-ol	05B140	Isoborneol
Exo-2-bornanol	05B140	Isoborneol
Exo-2-camphanol	05B140	Isoborneol
Fluoranthene	22B040	Fluoranthene
Fluorene	22A020	Fluorene
2-Fluorenol	18C120	2-Hydroxyfluorene
Fluorotrichloromethane	02A220	Trichlorofluoromethane
Formaldehyde	07A020	Formaldehyde
Formamide	08C020	Formamide
Formic acid	08A020	Formic acid
Formic acid amide	08C020	Formamide
Formosa camphor	07B100	Camphor
Formylamine	08C020	Formamide
Freon 11	02A220	Trichlorofluoromethane
Furan	24A020	Furan
Furfurane	24A020	Furan
Glycidol	06B020	2,3-Epoxy-1-propanol
Glycidyl alcohol	06B020	2,3-Epoxy-1-propanol
Glycol dichloride	02A260	1,2-Dichloroethane

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Glycolic acid	08B020	Hydroxyacetic acid
Grain alcohol	05A040	Ethanol
Guaiacol	18A060	2-Methoxyphenol
Guaiene	21A082	2,3-Dimethyl naphthalene
Hemimellitane	15B181	1,2,3-Trimethylbenzene
Hendecane	01A242	n-Undecane
n-Heptane	01A181	n-Heptane
Heptanes	01A180	Heptanes
1-Heptene	01B201	1-Heptene
cis-2-Heptene	01B202	cis-2-Heptene
trans-2-Heptene	01B203	trans-2-Heptene
cis-3-Heptene	01B204	cis-3-Heptene
4-Heptene	01B204	cis-3-Heptene
trans-3-Heptene	01B205	trans-3-Heptene
4-Heptene	01B205	trans-3-Heptene
Heptenes	01B200	Heptenes
Heptyl hydride	01A181	n-Heptane
a-Heptylene	01B201	1-Heptene
B-Heptylene	01B202	cis-2-Heptene
g-Heptylene	01B204	cis-3-Heptene
g-Heptylene	01B205	trans-3-Heptene
Hexabenzobenzene	21D100	Coronene
Hexachloro-1,3-butadiene	02B120	Hexachlorobutadiene
Hexachlorobenzene	16A162	Hexachlorobenzene
Hexachlorobutadiene	02B120	Hexachlorobutadiene
Hexachlorocyclohexane	02A380	Hexachlorocyclohexane
1a,2a,3b,4a,5a,6b-Hexachlorocyclohexane	02A380	Hexachlorocyclohexane
Hexachlorocyclopentadiene	02B140	Hexachlorocyclopentadiene
Hexachloroethane	02A320	Hexachloroethane
Hexadecanoic acid	08A122	Palmitic acid
Hexadecyclic acid	08A122	Palmitic acid
Hexahydroaniline	10A160	Cyclohexylamine
Hexahydrobenzene	01A160	Cyclohexane
Hexamethylene	01A160	Cyclohexane
Hexanaphthene	01A160	Cyclohexane
Hexanaphthylene	01B160	Cyclohexene
n-Hexane	01A141	n-Hexane
Hexane dioic acid	08A180	Adipic acid
6-Hexanelactam	08C060	6-Hexanelactam
Hexanes	01A140	Hexanes
Hexanoic acid	08A101	Caproic acid
1-Hexene	01B141	1-Hexene
Hexene	01B141	1-Hexene
cis-2-Hexene	01B142	cis-2-Hexene
trans-2-Hexene	01B143	trans-2-Hexene
cis-3-Hexene	01B144	cis-3-Hexene
trans-3-Hexene	01B145	trans-3-Hexene
Hexenes	01B140	Hexenes
Hexyl hydride	01A141	n-Hexane
Hexylene	01B141	1-Hexene
Hydracrylic acid-b-lactone	08B060	b-Propiolactone
Hydrazobenzene	11B080	1,2-Diphenylhydrazine
Hydrindene	15B020	Indan
Hydroquinol	18B060	1,4-Dihydroxybenzene
Hydroquinone	18B060	1,4-Dihydroxybenzene
2-Hydroxy anisole	18A060	2-Methoxyphenol
4-Hydroxy butanoic acid lactone	08B080	g-Butyrolactone
3-Hydroxy propionic acid lactone	08B060	b-Propiolactone
2-Hydroxy propylamine	10A123	1-Amino-2-propanol
3-Hydroxy-1,2-epoxypropane	06B020	2,3-Epoxy-1-propanol
1-Hydroxy-2-methoxybenzene	18A060	2-Methoxyphenol
1-Hydroxy-2-methyl glutaronitrile	09A100	1,3-Dicyano-1-hydroxybutane
Hydroxyacetic acid	08B020	Hydroxyacetic acid
Hydroxybenzene	18A020	Phenol
2-Hydroxybenzoic acid	08B041	2-Hydroxybenzoic acid
o-Hydroxybenzoic acid	08B041	2-Hydroxybenzoic acid

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
3-Hydroxybenzoic acid	08B042	3-Hydroxybenzoic acid
4-Hydroxybenzoic acid	08B043	4-Hydroxybenzoic acid
p-Hydroxybenzoic acid	08B043	4-Hydroxybenzoic acid
Hydroxybenzoic acids	08B040	Hydroxybenzoic acids
Hydroxybiphenyls	18A100	Phenylphenols
2-Hydroxydibenzofuran	18C140	2-Hydroxydibenzofuran
Hydroxyethanoic acid	08B020	Hydroxyacetic acid
2-Hydroxyethylamine	10A060	Ethanolamine
2-Hydroxyfluorene	18C120	2-Hydroxyfluorene
Hydroxyhydrindene	18C080	Indanols
Hydroxyindan	18C080	Indanols
a-Hydroxynaphthalene	18C020	1-Naphthol
2-Hydroxynaphthalene	18C040	2-Naphthol
2-Hydroxynitrobenzene	20A020	2-Nitrophenol
1-Hydroxyphenanthrene	18C061	1-Hydroxyphenanthrene
2-Hydroxyphenanthrene	18C062	2-Hydroxyphenanthrene
3-Hydroxyphenanthrene	18C063	3-Hydroxyphenanthrene
4-Hydroxyphenanthrene	18C064	4-Hydroxyphenanthrene
9-Hydroxyphenanthrene	18C065	9-Hydroxyphenanthrene
Hydroxyphenanthrenes	18C060	Phenanthrols
o-Hydroxyphenol	18B020	Catechol
2-Hydroxyphenol	18B020	Catechol
1-Hydroxypropane	05A060	1-Propanol
2-Hydroxypropane	05B020	2-Propanol
3-Hydroxypropylene oxide	06B020	2,3-Epoxy-1-propanol
a-Hydroxytoluene	05A140	Benzyl alcohol
Hydroxytoluene	18A040	Cresols
Indan	15B020	Indan
1-Indanol	18C081	1-Indanol
4-Indanol	18C082	4-Indanol
5-Indanol	18C083	5-Indanol
Indanols	18C080	Indanols
Indene	22A010	Indene
11-Indeno(1,2-b)quinoline	23B280	2,3-Benz-4-azafluorene
Indeno(1,2,3-cd)pyrene	22D020	Indeno(1,2,3-cd)pyrene
Indeno(1,2,3-ij)isoquinoline	23B300	Indeno(1,2,3-ij)isoquinoline
Indole	23C040	Indole
Indonaphthene	22A010	Indene
Iodomethane	02A060	Methyl Iodide
IP	22D020	Indeno(1,2,3-cd)pyrene
Isoacetophorone	07B080	Isophorone
Isoamyl acetate	08D143	Isoamyl acetate
sec-Isoamyl alcohol	05B063	3-Methyl-2-butanol
Isoamyl alsohol	05A124	3-Methyl-1-butanol
a-Isoamyl hydride	01A102	Isopentane
Isoborneol	05B140	Isoborneol
Isobutane	01A082	Isobutane
Isobutanol	05A100	Isobutyl alcohol
Isobutene	01B064	Isobutylene
Isobutyl acetate	08D123	Isobutyl acetate
Isobutyl alcohol	05A100	Isobutyl alcohol
Isobutylene	01B064	Isobutylene
Isodurene	15B202	1,2,3,5-Tetramethylbenzene
Isoheptane	01A182	Isoheptane
Isohexane	01A142	Isohexane
Isononane	01A222	Isononane
Isooctane	01A202	Isooctane
Isopentaldehyde	07A122	3-Methylbutanal
Isopentane	01A102	Isopentane
Isophorone	07B080	Isophorone
Isopropanolamine	10A123	1-Amino-2-propanol
2-Isopropoxy propane	03A020	Isopropyl ether
Isopropyl acetate	08D102	Isopropyl acetate
Isopropyl alcohol	05B020	2-Propanol
Isopropyl benzene	15A120	Isopropyl benzene
Isopropyl benzol	15A120	Isopropyl benzene

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Isopropyl ether	03A020	Isopropyl ether
Isopropyl methyl carbinol	05B063	3-Methyl-2-butanol
Isopropyl-benzo(c)phenanthrene	21B112	Isopropyl-benzo(c)phenanthrene
Isopropylidene chloride	02A344	2,2-Dichloropropane
Isopropylmercaptan	13A062	Propane-2-thiol
Isoquinoline	23B021	Isoquinoline
Isovaleral	07A122	3-Methylbutanal
Isovaleraldehyde	07A122	3-Methylbutanal
Isovaleric aldehyde	07A122	3-Methylbutanal
Lauric acid	08A104	Lauric acid
Leucoline	23B022	Isoquinoline
Lindane	02A380	Hexachlorocyclohexane
2,3-Lutidine	23A141	2,3-Dimethylpyridine
2,4-Lutidine	23A142	2,4-Dimethylpyridine
2,5-Lutidine	23A143	2,5-Dimethylpyridine
2,6-Lutidine	23A144	2,6-Dimethylpyridine
3,4-Lutidine	23A145	3,4-Dimethylpyridine
M.E.K.	07B060	Butanone
Maleic acid	08A060	Maleic acid
Maleinic acid	08A060	Maleic acid
Malenic acid	08A060	Maleic acid
Marsh gas	01A020	Methane
p-Menth-1-en-8-ol	05C060	a-Terpineol
p-Mentha-6,8-dien-2-one	07B181	Carvone (d or 1)
Mercaptobenzene	13A100	Benzenethiol
1-Mercaptopropanol	13A061	Propane-1-thiol
Mesitol	18A181	2,4,6-Trimethyl phenol
Mesitylene	15B183	1,3,5-Trimethylbenzene
Methacrylic acid	08D080	Methyl methacrylate
2-Methaloctane	01A222	Isononane
Methanal	07A020	Formaldehyde
Methanamide	08C020	Formamide
Methane	01A020	Methane
Methane trichloride	02A100	Chloroform
Methanecarboxamide	08C040	Acetamide
Methanethiol	13A020	Methanethiol
Methanoic acid	08A020	Formic acid
Methanol	05A020	Methanol
1-Methoxy-2-nitrobenzene	17B021	1-Methoxy-2-nitrobenzene
1-Methoxy-3-nitrobenzene	17B022	1-Methoxy-3-nitrobenzene
1-Methoxy-4-nitrobenzene	17B023	1-Methoxy-4-nitrobenzene
Methoxyaniline	10C080	Anisidines
m-Methoxyaniline	10C082	m-Anisidine
2-Methoxybiphenyl	03A040	2-Methoxybiphenyl
Methoxynitrobenzenes	17B020	Methoxynitrobenzenes
2-Methoxyphenol	18A060	2-Methoxyphenol
Methyl a-methylacrylate	08D080	Methyl methacrylate
Methyl acetate	08D020	Methyl acetate
Methyl alcohol	05A020	Methanol
Methyl aldehyde	07A020	Formaldehyde
Methyl anilines	10C040	Aminotoluenes
Methyl benzoate	08D160	Methyl benzoate
2-Methyl benzothiazole	23D040	2-Methyl benzothiazole
Methyl bromide	02A020	Methyl bromide
Methyl butene	01B101	1-Pentene
Methyl chloride	02A040	Methyl chloride
Methyl chloroform	02A280	Trichloroethane
Methyl chloromethyl ether	04A020	Chloromethyl methyl ether
4-Methyl chrysene	21B141	4-Methyl chrysenes
5-Methyl chrysene	21B142	5-Methyl chrysene
Methyl chrysenes	21B140	Methyl chrysenes
Methyl cyanide	09A020	Acetonitrile
Methyl diphenyl ether	03A040	2-Methoxybiphenyl
Methyl dithiomethane	13B080	Methyldisulfide
Methyl ester	08D080	Methyl methacrylate
Methyl ester of benzoic acid	08D160	Methyl benzoate

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
1-Methyl ethyl benzene	15A120	Isopropyl benzene
Methyl ethyl ketone	07B060	Butanone
Methyl glycol	06A040	Propylene glycol
Methyl hydride	01A020	Methane
Methyl iodide	02A060	Methyl iodide
Methyl mercaptan	13A020	Methanethiol
Methyl methacrylate	08D080	Methyl methacrylate
Methyl methylacrylate	08D080	Methyl methacrylate
1-Methyl naphthalene	21A041	1-Methyl naphthalene
2-Methyl naphthalene	21A042	2-Methyl napthalene
1-Methyl phenanthrene	21A201	1-Methyl phenanthrene
3-Methyl phenanthrene	21A202	3-Methyl phenanthrene
Methyl phenanthrenes	21A200	Methyl phenanthrenes
Methyl phenyl nitrosamine	12B020	N-Methyl-N-nitrosoaniline
Methyl propyl carbinol	05B061	2-Pentanol
Methyl sulfide	13B020	Dimethyl sulfide
Methyl sulfoxide	14B020	Dimethyl sulfoxide
a-Methyl-a-hydroxy toluene	05B100	1-Phenylethanol
1-Methyl-benzo(c)phenanthrene	21B102	1-Methyl-benzo(c)phenanthrene
2-Methyl-benzo(c)phenanthrene	21B103	2-Methyl-benzo(c)phenanthrene
5-Methyl-benzo(c)phenanthrene	21B104	5-Methyl-benzo(c)phenanthrene
6-Methyl-benzo(c)phenanthrene	21B105	6-Methyl-benzo(c)phenanthrene
7-Methyl-benzo(c)phenanthrene	21B106	7-Methyl-benzo(c)phenanthrene
8-Methyl-benzo(c)phenanthrene	21B107	8-Methyl-benzo(c)phenanthrene
2-Methyl-methyl ester	08D080	Methyl methacrylate
N-Methyl-N-nitrosoaniline	12B020	N-Methyl-N-nitrosoaniline
N-Methyl-N-nitrosobenzenamine	12B020	N-Methyl-N-nitrosoaniline
2-Methyl-1-butanol	05A122	2-Methyl-1-butanol
3-Methyl-1-butanol	05A124	3-Methyl-1-butanol
3-Methyl-1-butanol acetate	08D143	Isoamyl acetate
2-Methyl-1-propanol	05A100	Isobutyl alcohol
Methyl-1,2-benzophenanthrene	21B140	Methyl chrysenes
3-Methyl-2-butanol	05B063	3-Methyl-2-butanol
2-Methyl-2-butanol	05C040	t-Pentanol
1-Methyl-2-chlorobenzene	16A180	2-Chlorotoluene
2-Methyl-2-phenyl propane	15A143	tert-Butyl benzene
2-Methyl-2-phenyl propane	15A143	tert-Butyl benzene
2-Methyl-2-propanol	05C020	t-Butyl alcohol
2-Methyl-4,6-dinitrophenol	20B020	4,6-Dinitro-o-cresol
2-Methyl-5-(1-methylethenyl)-2-cyclohexene-1-one	07B181	Carvone (d or l)
Methylacetylene	01C040	Propyne
Methylallene	01B081	1,2-Butadiene
Methylamine	10A020	Methylamine
Methylbenzene	15A040	Toluene
Methylbenzene carboxylate	08D160	Methyl benzoate
2-Methylbenzofuran	24A061	2-Methylbenzofuran
3-Methylbenzofuran	24A062	3-Methylbenzofuran
5-Methylbenzofuran	24A063	5-Methylbenzofuran
7-Methylbenzofuran	24A064	7-Methylbenzofuran
Methylbenzofurans	24A060	Methylbenzofurans
a-Methylbenzyl alcohol	05B100	1-Phenylethanol
2-Methylbutanal	07A121	2-Methylbutanal
3-Methylbutanal	07A122	3-Methylbutanal
Methylbutanals	07A120	Methylbutanals
2-Methylbutane	01A102	Isopentane
2-Methylbutyraldehyde	07A121	2-Methylbutanal
a-Methylbutyraldehyde	07A121	2-Methylbutanal
3-Methylbutyraldehyde	07A122	3-Methylbutanal
3-Methylcarbazole	23C101	3-Methylcarbazole
9-Methylcarbazole	23C102	9-Methylcarbazole
Methylcarbazoles	23C100	Methylcarbazoles
Methylcatechol	18A060	2-Methoxyphenol
20-Methylchlolanthrene	21B080	3-Methylcholanthrene
3-Methylchlolanthrene	21B080	3-Methylcholanthrene
Methyldibenzopyrrole	23C100	Methylcarbazoles
Methyldibenzopyrrole	23C101	3-Methylcarbazole

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
9-Methyldibenzopyrrole	23C102	9-Methylcarbazole
Methyldiphenylenimine	23C100	Methylcarbazoles
3-Methyldiphenylenimine	23C101	3-Methylcarbazole
9-Methyldiphenylenimine	23C102	9-Methylcarbazole
Methyldisulfide	13B080	Methyldisulfide
Methylene bichloride	02A080	Methylene chloride
4,4'-Methylene bis(2-chloroaniline)	10C180	4,4'-Methylene bis(2-chloroaniline)
Methylene chloride	02A080	Methylene chloride
Methylene oxide	07A020	Formaldehyde
Methylethylbromoethane	02A362	2-Bromobutane
Methylethylene glycol	06A040	Propylene glycol
2-Methylheptane	01A202	Isooctane
2-Methylhexane	01A182	Isoheptane
Methylhydrazine	11B020	Monomethylhydrazine
2-Methylindole	23C061	2-Methylindole
3-Methylindole	23C062	3-Methylindole
Methylindoles	23C060	Methylindoles
3-Methyllepidine	23B064	3,4-Dimethylquinoline
Methylmethane	01A040	Ethane
Methylnitrobenzenes	17A040	Nitrotoluenes
Methylnitrosophenylamine	12B020	N-Methyl-N-nitrosoaniline
2-Methylpentane	01A142	Isohexane
Methylphenol	18A040	Cresols
Methylphenylcarbinol	05B100	1-Phenylethanol
2-Methylpropane	01A082	Isobutane
2-Methylpropene	01B064	Isobutylene
1-Methylpropyl benzene	15A142	sec-Butyl benzene
1-Methylpropyl benzene	15A142	sec-Butyl benzene
a-Methylpropylethanoate	08D122	sec-Butyl acetate
b-Methylpropylethanoate	08D123	Isobutyl acetate
1-Methylpyrene	21B200	1-Methylpyrene
2-Methylpyridine	23A041	2-Methylpyridine
3-Methylpyridine	23A042	3-Methylpyridine
4-Methylpyridine	23A042	4-Methylpyridine
Methylpyridines	23A040	Picolines
3-Methylquinaldine	23B061	2,3-Dimethylquinoline
6-Methylquinaldine	23B062	2,6-Dimethylquinoline
2-Methylquinoline	23B040	2-Methylquinoline
Methylthiomethane	13B020	Dimethyl sulfide
2-Methylthiophene	25A041	2-Methylthiophene
3-Methylthiophene	25A042	3-Methylthiophene
Methylthiophenes	25A040	Methylthiophenes
Mono-n-propylamine	10A100	1-Aminopropane
Monoalkyl naphthalenes	21A040	Monoalkyl naphthalenes
Monoallyamine	10A110	3-Aminopropene
Monobromomethane	02A020	Methyl Bromide
Monochloroethane	02A250	Ethyl chloride
Monochloromethyl ether	04A020	Chloromethyl methyl ether
Monomethylamine	10A020	Methylamine
Monomethylhydrazine	11B020	Monomethylhydrazine
Monosubstituted alkyl pyridines	23A060	Monosubstituted alkyl pyridines
Morpholine	10B100	Morpholine
Myristic acid	08A121	Myristic acid
Naphthacene	21B020	Naphthacene
a-Naphthacridine	23B200	Benz(c)acridine
Naphthalene	21A020	Naphthalene
1-Naphthalenol	18C020	1-Naphthol
Naphthalin	21A020	Naphthalene
Naphthaline	21A020	Naphthalene
Naphthene	21A020	Naphthalene
Naphtho(1,2-b)furan	24B041	Naphtho(1,2-b)furan
Naphtho(2,1-b)furan	24B042	Naphtho(2,1-b)furan
Naphtho(2,3-b)furan	24B043	Naphtho(2,3-b)furan
Naphtho-1',2':2,3-anthracene	21C020	1,2-Benzonaphthacene
Naphthofurans	24B040	Naphthofurans
1-Naphthol	18C020	1-Naphthol

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
a-Naphthol	18C020	1-Naphthol
2-Naphthol	18C040	2-Naphthol
b-Naphthol	18C040	2-Naphthol
a-Naphthonitrile	09B041	a-Naphthonitrile
1-Naphthonitrile	09B041	a-Naphthonitrile
b-Naphthonitrile	09B042	b-Naphthonitrile
2-Naphthonitrile	09B042	b-Naphthonitrile
Naphthonitriles	09B040	Naphthonitriles
Naphthopyridine	23B140	Benzo(f)quinoline
b-Naphthoquinoline	23B140	Benzo(f)quinoline
a-Naphthoquinoline	23B160	Benzo(h)quinoline
b-Naphthyl hydroxide	18C040	2-Naphthol
1-Naphthylamine	10C200	1-Aminonaphthalene
a-Naphthylamine	10C200	1-Aminonaphthalene
2-Naphthylamine	10C220	2-Aminonaphthalene
b-Naphthylamine	10C220	2-Aminonaphthalene
Naphthyleneethylene	21A100	Acenaphthene
2,3-Naptho-2,3-phenanthrene	21C020	1,2-Benzonaphthacene
Necatorina	02A240	Carbon Tetrachloride
Neopentane	01A103	Neopentane
Neopentyl alcohol	05A123	2,2-Dimethyl-1-propanol
Nitroanisoles	17B020	Methoxynitrobenzenes
Nitrobenzene	17A020	Nitrobenzene
4-Nitrobiphenyl	17A060	4-Nitrobiphenyl
p-Nitrobiphenyl	17A060	4-Nitrobiphenyl
p-Nitrochlorobenzene	17B060	1-Chloro-4-nitrobenzene
4-Nitrodiphenyl	17A060	4-Nitrobiphenyl
2-Nitrophenol	20A020	2-Nitrophenol
o-Nitrophenol	20A020	2-Nitrophenol
3-Nitrophenol	20A040	3-Nitrophenol
m-Nitrophenol	20A040	3-Nitrophenol
4-Nitrophenol	20A060	4-Nitrophenol
p-Nitrophenol	20A060	4-Nitrophenol
Nitrophenyl methyl ethers	17B020	Methoxynitrobenzenes
N-Nitroso-N-dipropylamine	12A060	N-Nitrosodipropylamine
N-Nitroso-N-methylaniline	12B020	N-Methyl-N-nitrosoaniline
N-Nitrosodiethylamine	12A040	N-Nitrosodiethylamine
N-Nitrosodiisopropylamine	12A080	N-Nitrosodiisopropylamine
Nitrosodiisopropylamine	12A080	N-Nitrosodiisopropylamine
N-Nitrosodimethylamine	12A020	N-Nitrosodimethylamine
N-Nitrosodipentylamine	12A100	N-Nitrosodipentylamine
N-Nitrosodiphenylamine	12B040	N-Nitrosodiphenylamine
N-Nitrosodipropylamine	12A060	N-Nitrosodipropylamine
Nitrosomethylaniline	12B020	N-Methyl-N-nitrosoaniline
N-Nitrosophenylamine	12B020	N-Methyl-N-nitrosoaniline
2-Nitrotoluene	17A041	2-Nitrotoluene
3-Nitrotoluene	17A042	3-Nitrotoluene
4-Nitrotoluene	17A043	4-Nitrotoluene
Nitrotoluenes	17A040	Nitrotoluenes
Nitrous diisopropylamide	12A080	N-Nitrosodiisopropylamine
Nitrous diphenylamide	12B040	N-Nitrosodiphenylamine
Nitrous dipropyl amide	12A060	N-Nitrosodipropylamine
n-Nonane	01A221	n-Nonane
Nonanes	01A220	Nonanes
Nonyl alcohol	05B080	2,6-Dimethyl-4-heptanol
Octadecanoic acid	08A123	Stearic acid
cis-9-Octadecanoic acid	08A140	Oleic acid
n-Octane	01A201	n-Octane
Octanes	01A200	Octanes
Octanoic acid	08A102	Caprylic acid
Octyl phthalate	08D300	Di-2-ethylhexyl phthalate
Oleic acid	08A140	Oleic acid
2-Oxetanone	08B060	b-Propiolactone
2-Oxobovane	07B100	Camphor
Oxole	24A020	Furan
Oxybenzene	18A020	Phenol

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
1,1'-Oxybis (2-chloroethane)	04B080	2,2'-Dichlorodiethyl ether
Oxybis[chloromethane]	04B020	1,1'-Dichloromethyl ether
2,2'-Oxybis[propane]	03A020	Isopropyl ether
Palmitic acid	08A122	Palmitic acid
b-Parvolone	23A146	2,3,4,6-Tetramethylpyridine
PCB's	16A220	Polychlorinated biphenyls
Pentachlorophenol	19A060	Pentachlorophenol
Pentamethylene	01A120	Cyclopentane
n-Pentane	01A101	n-Pentane
Pentanes	01A100	Pentanes
Pentanoic acid	08A080	Valeric acid
n-Pentanol	05A121	n-Pentanol
1-Pentanol	05A121	n-Pentanol
2-Pentanol	05B061	2-Pentanol
3-Pentanol	05B062	3-Pentanol
t-Pentanol	05C040	t-Pentanol
Pentanols, (primary)	05A120	Pentanols, (primary)
Pentanols, (secondary)	05B060	Pentanols, (secondary)
1-Pentene	01B101	1-Pentene
cis-2-Pentene	01B102	cis-2-Pentene
trans-2-Pentene	01B103	trans-2-Pentene
Pentenes	01B100	Pentenes
2-Pentyl acetate	08D142	sec-Amyl acetate
t-Pentyl alcohol	05C040	t-Pentanol
1-Pentylene	01B101	1-Pentene
Perchlorobenzene	16A162	Hexachlorobenzene
Perchlorocyclopentadiene	02B140	Hexachlorocyclopentadiene
Perchloroethane	02A320	Hexachloroethane
Perchloroethylene	02B080	Tetrachloroethene
Perchloromethane	02A240	Carbon Tetrachloride
Perchloromethanethiol	13A140	Perchloromethanethiol
Perchloromethyl mercaptan	13A140	Perchloromethanethiol
Periethylenenaphthalene	21A100	Acenaphthene
Perylene	21C140	Perylene
Phenanthrene	21A180	Phenanthrene
Phenanthridine	23B120	Phenanthridine
Phenanthro(9,10-b)furan	24B080	Phenanthro(9,10-b)furan
Phenanthrols	18C060	Phenanthrols
Phenanthrylene methane	22B080	Cyclopenta(def)phenanthrene
Phene	15A020	Benzene
Phenethyl alcohol	05A160	Phenethyl alcohol
B-Phenethyl alcohol	05A160	Phenethyl alcohol
a-Phenethyl alcohol	05B100	1-Phenylethanol
Phenic acid	18A020	Phenol
Phenol	18A020	Phenol
o-Phenyl anisole	03A040	2-Methoxybiphenyl
Phenyl benzoate	08D180	Phenyl benzoate
Phenyl bromide	16A040	Bromobenzene
1-Phenyl butane	15A141	n-Butyl benzene
2-Phenyl butane	15A142	sec-Butyl benzene
2-Phenyl butane	15A142	sec-Butyl benzene
Phenyl chloride	16A020	Chlorobenzene
Phenyl cyanide	09B020	Benzonitrile
Phenyl formic acid	08A160	Benzoic acid
Phenyl hydroxide	18A020	Phenol
Phenyl mercaptan	13A100	Benzenethiol
Phenyl methanol	05A140	Benzyl alcohol
Phenyl methyl ketone	07B120	Acetophenone
1-Phenyl propane	15A100	Propyl benzene
Phenyl pyridines	23A080	Phenyl pyridines
2-Phenyl pyridines	23A081	2-Phenyl pyridines
3-Phenyl pyridines	23A082	3-Phenyl pyridines
4-Phenyl pyridines	23A083	4-Phenyl pyridines
Phenyl sulfide	13B060	Diphenyl sulfide
Phenylaldehyde	07A140	Benzaldehyde
Phenylamine	10C020	Aniline

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
p-Phenylaniline	10C120	4-Aminobiphenyl
Phenylbenzene	15A160	Biphenyl
Phenylcarbinol	05A140	Benzyl alcohol
p-Phenylenediamine	10C100	1,4-Diaminobenzene
2,3-o-Phenylenepyrene	22D020	Indeno(1,2,3-cd)pyrene
Phenylethane	15A060	Ethyl benzene
2-Phenylethanol	05A160	Phenethyl alcohol
1-Phenylethanol	05B100	1-Phenyletnanol
1-Phenylethanone	07B120	Acetophenone
Phenylethylene	15A080	Styrene
Phenylhydride	15A020	Benzene
Phenylic acid	18A020	Phenol
Phenylmethane	15A040	Toluene
Phenylmethyl alcohol	05A140	Benzyl alcohol
1-Phenylnaphthalene	21A061	1-Phenylnaphthalene
2-Phenylnaphthalene	21A062	2-Phenylnaphthalene
Phenylnaphthalenes	21A060	Phenylnaphthalenes
o-Phenylphenol	18A101	o-Phenylphenol
p-Phenylphenol	18A102	p-Phenylphenol
m-Phenylphenol	18A103	m-Phenylphenol
Phenylphenols	18A100	Phenylphenols
2-Phenylpropane	15A120	Isopropyl benzene
Phenylsulfonic acid	14A020	Benzenesulfonic acid
Phenylthiobenzene	13B060	Diphenyl sulfide
Phthalate esters	08D280	Phthalate esters
Phthalic acid	08A200	Phthalic acid
o-Phthalic acid	08A200	Phthalic acid
Picene	21C160	Picene
Picolines	23A040	Picolines
Picramic acid	20A080	2-Amino-4,6-dinitrophenol
Picraminic acid	20A080	2-Amino-4,6-dinitrophenol
Picric acid	20A120	2,4,6-Trinitrophenol
Polyalkyl phenols (MW greater than 135)	18A180	Polyalkyl phenols (MW greater than 135)
Polychlorinated benzenes	16A160	Polychlorinated benzenes
Polychlorinated Biphenyls (PCB's)	16A220	Polychlorinated biphenyls (PCB's)
Prehnitene	15B201	1,2,3,4-Tetramethylbenzene
Propaldehyde	07A080	Propionaldehyde
Propanal	07A080	Propionaldehyde
Propanamine	10A100	1-Aminopropane
Propane	01A060	Propane
Propane	01B040	Propylene
Propane-1-thiol	13A061	Propane-1-thiol
Propane-2-thiol	13A062	Propane-2-thiol
1,2-Propanediol	06A040	Propylene glycol
2-Propanenitrile	09A040	Acrylonitrile
Propanenitrile	09A060	1-Cyanoethane
1-Propanethiol	13A061	Propane-1-thiol
2-Propanethiol	13A062	Propane-2-thiol
Propanethiols	13A060	Propanethiols
Propanoic acid-3-hydroxy lactone	08B060	b-Propiolactone
1-Propanol	05A060	1-Propanol
2-Propanol	05B020	2-Propanol
B-Propanolamine	10A121	2-Amino-1-propanol
Propanolamines	10A120	Propanolamines
Propanolide	08B060	b-Propiolactone
2-Propanone	07B020	Acetone
Propenal	07A060	Acrolein
2-Propene-1-amine	10A110	3-Aminopropene
2-Propenoic acid ethyl ether	08D060	Ethyl acrylate
Propine	01C040	Propyne
b-Propiolactone	08B060	b-Propiolactone
Propionaldehyde	07A080	Propionaldehyde
Propionitrile	09A060	1-Cyanoethane
b-Propiono lactone	08B060	b-Propiolactone
n-Propyl acetate	08D101	n-Propyl acetate
Propyl acetates	08D100	Propyl acetates

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
n-Propyl alcohol	05A060	1-Propanol
Propyl aldehyde	07A080	Propionaldehyde
Propyl benzene	15A100	Propyl benzene
Propyl cyanide	09A080	Butyronitrile
Propyl nitrosamine	12A060	N-Nitrosodipropylamine
n-Propyl-benzo(c)phenanthrene	21B111	n-Propyl-benzo(c)phenanthrene
Propylacetic acid	08A080	Valeric acid
n-Propylamine	10A100	1-Aminopropane
Propylene	01B040	Propylene
Propylene chloride	02A342	1,2-Dichloropropane
Propylene dichloride	02A342	1,2-Dichloropropane
Propylene glycol	06A040	Propylene glycol
Propylethylene	01B101	1-Pentene
Propylidene chloride	02A341	1,1-Dichloropropane
Propylidene dichloride	02A341	1,1-Dichloropropane
Propylmercaptan	13A061	Propane-1-thiol
Di-n-propylnitrosamine	12A060	N-Nitrosodipropylamine
4-n-Propylpyridine	23A064	4-n-Propylpyridine
Propyne	01C040	Propyne
Pseudobutyl benzene	15A143	tert-Butyl benzene
Pseudobutyl benzene	15A143	tert-Butyl benzene
Pseudobutylene	01B062	cis-2-Butene
Pseudocumene	15B182	1,2,4-Trimethylbenzene
Pyrene	21B180	Pyrene
Pyridine	23A020	Pyridine
a-Pyridylbenzene	23A081	2-Phenyl pyridines
a-Pyridylbenzene	23A081	2-Phenyl pyridines
b-Pyridylbenzene	23A082	3-Phenyl pyridines
g-Pyridylbenzene	23A083	4-Phenyl pyridines
Pyrocatechol	18B020	Catechol
Pyrogallic acid	18B080	1,2,3-Trihydroxybenzene
Pyrogallol	18B080	1,2,3-Trihydroxybenzene
Pyrrole	23C020	Pyrrole
p,p'-Quaterphenyl	15B060	4,4'-Diphenylbiphenyl
Quinaldine	23B040	2-Methylquinoline
Quinol	18B060	1,4-Dihydroxybenzene
Quinoline	23B021	Quinoline
Quinolines	23B020	Quinolines
Resorcinol	18B040	1,3-Dihydroxybenzene
Rubbing alcohol	05B020	2-Propanol
Salicylic acid	08B041	2-Hydroxybenzoic acid
Saturated Long Chain Acids (MW:116-201)	08A100	Saturated Long Chain Acids (MW:116-201)
Saturated Long Chain Acids(MW:228-285)	08A120	Saturated Long Chain Acids(MW:228-285)
Secondary butylamine	10A142	2-Aminobutane
Skatole	23C062	3-Methylindole
Stearic acid	08A123	Stearic acid
Styrene	15A080	Styrene
Styrolene	15A080	Styrene
Sulfinylbis[methane]	14B020	Dimethyl sulfoxide
Tar camphor	21A020	Naphthalene
Telone	02B103	cis-1,3-Dichloropropene
o-Terphenyl	15B161	o-Terphenyl
m-Terphenyl	15B162	m-Terphenyl
p-Terphenyl	15B163	p-Terphenyl
Terphenyls	15B160	Terphenyls
a-Terpineol	05C060	a-Terpineol
Tertiary butylamine	10A143	2-Amino-2-methylpropane
Tetracene	21B020	Naphthacene
1,1,3,3-Tetrachloro-2-propanone	07C020	Tetrachloroacetone
Tetrachloroacetone	07C020	Tetrachloroacetone
1,1,2,2-Tetrachloroethane	02A300	1,1,2,2-Tetrachloroethane
Tetrachloroethene	02B080	Tetrachloroethene
Tetrachloroethylene	02B080	Tetrachloroethene
Tetrachloromethane	02A240	Carbon Tetrachloride
Tetradecanoic acid	08A121	Myristic acid
n-Tetradecoic acid	08A121	Myristic acid

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Tetrahydro-1,4-oxazine	10B100	Morpholine
3a,7,7,7a-Tetrahydro-4,7-methanoindene	01B220	Dicyclopentadiene
3,4,5,6-Tetrahydrobenzene	01B160	Cyclohexene
Tetrahydrobenzene	01B160	Cyclohexene
Tetrahydrofuran	03A060	Tetrahydrofuran
Tetrahydronaphthalene	15B120	Tetrahydronaphthalene
Tetralin	15B120	Tetrahydronaphthalene
Tetraline	15B120	Tetrahydronaphthalene
1,2,3,4-Tetramethylbenzene	15B201	1,2,3,4-Tetramethylbenzene
1,2,3,5-Tetramethylbenzene	15B202	1,2,3,5-Tetramethylbenzene
1,2,4,5-Tetramethylbenzene	15B203	1,2,4,5-Tetramethylbenzene
Tetramethylbenzenes	15B200	Tetramethylbenzenes
Tetramethylmethane	01A103	Neopentane
Tetramethylsuccinonitrile	09A120	Tetramethylsuccinonitrile
Tetraphenyl	15B060	4,4'-Diphenylbiphenyl
Tetrole	24A020	Furan
1-1'-Thiobis[benzene]	13B060	Diphenyl sulfide
1-1'-Thiobisethane	13B040	Diethyl sulfide
Thiobismethane	13B020	Dimethyl sulfide
Thioethylether	13B040	Diethyl sulfide
Thiofuran	25A020	Thiophene
Thionaphthene	25B040	Benzo(b)thiophene
Thiophene	25A020	Thiophene
Thiophenol	13A100	Benzenethiol
2,3-Thioxene	25A061	2,3-Dimethylthiophene
2,4-Thioxene	25A062	2,4-Dimethylthiophene
a,a-Thioxene	25A063	2,5-Dimethylthiophene
TMSN	09A120	Tetramethylsuccinonitrile
Toluene	15A040	Toluene
a-Toluenol	05A140	Benzyl alcohol
Toluidines	10C040	Aminotoluenes
Toluol	15A040	Toluene
o-Toluquinaldine	23B120	2,8-Dimethylquinoline
o-Tolyl chloride	16A180	2-Chlorotoluene
Toxilic acid	08A060	Maleic acid
Tri-m-tolyl phosphate	26B043	Tri-m-tolyl phosphate
Tri-o-cresyl phosphate	260B42	Tri-o-tolyl phosphate
Tri-o-tolyl phosphate	26B041	Tri-o-tolyl phosphate
Tri-p-tolyl phosphate	26B042	Tri-p-tolyl phosphate
Tribenzylene benzene	22D040	Tribenzylene benzene
Tribromomethane	02A160	Bromoform
1,2,4-Trichlorobenzene	16A161	1,2,4-Trichlorobenzene
Trichloroethane	02A280	Trichloroethane
1,1,1-Trichloroethane	02A280	Trichloroethane
1,1,2-Trichloroethane	02A290	1,1,2-Trichloroethane
B-Trichloroethane	02A290	1,1,2-Trichloroethane
Trichloroethylene	02B070	Trichloroethylene
Trichlorofluoromethane	02A220	Trichlorofluoromethane
Trichloromethane	02A100	Chloroform
Trichloromethanethiol	13A140	Perchloromethanethiol
Trichloromonofluoromethane	02A220	Trichlorofluoromethane
2,4,6-Trichlorophenol	19A050	2,4,6-Trichlorophenol
Tricresol phosphate	26B040	Tritolyl phosphate
Triethyl phosphate	26A020	Triethyl phosphate
1,2,3-Trihydroxybenzene	18B080	1,2,3-Trihydroxybenzene
Trimethyl and tetramethyl thiophenes	25A080	Trimethyl and tetramethyl thiophenes
Trimethyl carbinol	05C020	t-Butyl alcohol
2,4,6-Trimethyl phenol	18A181	2,4,6-Trimethyl phenol
3,5,5-Trimethyl-2-cyclohexene-1-one	07B080	Isophorone
a,a,4-Trimethyl-3-cyclohexene-1-methanol	05C060	a-Terpineol
1,2,3-Trimethylbenzene	15B181	1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene	15B182	1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene	15B183	1,3,5-Trimethylbenzene
Trimethylbenzenes	15B180	Trimethylbenzenes
1,7,7-Trimethylbicylo[2.2.1]heptan-2-one	07B100	Camphor
Trimethylbromomethane	02A363	2-Bromoisobutane

COMPOUND/ELEMENT	CATEGORY	PREFERRED NAME
Trimethylene chloride	02A343	1,3-Dichloropropane
Trimethylmethane	01A082	Isobutane
2,2,4-Trimethylpentane	01A202	Isooctane
Trimethylphenyl methane	15A143	tert-Butyl benzene
Trimethylphenyl methane	15A143	tert-Butyl benzene
Trimethylpyridines	23A120	Collidines
2,3,5-Trimethylthiophene	25A081	2,3,5-Trimethylthiophene
2,4,6-Trinitrophenol	20A120	2,4,6-Trinitrophenol
Triorthocresol phosphate	26B041	Tri-o-tolyl phosphate
Triphenyl phosphate	26B020	Triphenyl phosphate
Triphenylene	21B160	Triphenylene
Tritolyl phosphate	26B040	Tritolyl phosphate
Truxene	22D040	Tribenzylene benzene
TSN	09A120	Tetramethylsuccinonitrile
n-Undecane	01A242	n-Undecane
Unsym-trichlorobenzene	16A161	1,2,4-Trichlorobenzene
Unsymmetrical dimethylhydrazine	11B040	N,N-Dimethylhydrazine
Valerianic acid	08A080	Valeric acid
Valeric acid	08A080	Valeric acid
Vinyl benzene	15A080	Styrene
Vinyl chloride	02B020	Vinyl chloride
Vinyl cyanide	09A040	Acrylonitrile
Vinylidene chloride	02B050	1,1-Dichloroethene
Wood alcohol	05A020	Methanol
o-Xylene	15B081	o-Xylene
m-Xylene	15B082	m-Xylene
p-Xylene	15B083	p-Xylene
o-Xylene chloride	16B041	1,2-bis (Chloromethyl) benzene
m-Xylene chloride	16B042	1-3-bis (Chloromethyl) benzene
p-Xylene chloride	16B043	1,4-bis (Chloromethyl) benzene
Xylenes	15B080	Xylenes
2,3-Xylenol	18A141	2,3-Xylenol
2,4-Xylenol	18A142	2,4-Xylenol
2,5-Xylenol	18A143	2,5-Xylenol
2,6-Xylenol	18A144	2,6-Xylenol
3,5-Xylenol	18A145	3,5-Xylenol
3,4-Xylenol	18A146	3,4-Xylenol
Xylenols	18A140	Xylenols
2,3-Xylidine	10C061	2,3-Xylidine
2,4-Xylidine	10C062	2,4-Xylidine
2,5-Xylidine	10C063	2,5-Xylidine
2,6-Xylidine	10C064	2,6-Xylidine
3,4-Xylidine	10C065	3,4-Xylidine
3,5-Xylidine	10C066	3,5-Xylidine
Xylidines	10C060	Dimethylanilines
Xylol	15B080	Xylenes

MOLECULAR FORMULA INDEX FOR ORGANIC COMPOUNDS ADDRESSED BY MEG'S

CBr_2Cl_2 02A180
CCl_2F_2 02A200
CCl_3F 02A220
CCl_4 02A240
$CHBrCl_2$ 02A120
$CHBr_2Cl$ 02A140
$CHBr_3$ 02A160
$CHCL_3$ 02A100
$CHCl_3S$ 13A140
CH_2Cl_2 02A080
CH_2O 07A020
CH_2O_2 08A020
CH_2N_2 11A020
CH_3Br 02A020
CH_3Cl 02A040
CH_3I 02A060
CH_3 08C020
CH_4 01A020
CH_4O 05A020
CH_4S 13A020
CH_5N 10A020
CH_6N_2 11B020
$C_2Cl_2F_2$ 02B090
C_2Cl_4 02B080
C_2HCl_3 02B070
C_2Cl_6 02A320
C_2H_2 01C020
$C_2H_2Cl_2$ 02B040
$C_2H_2Cl_2$ 02B060
$C_2H_2Cl_4$ 02A300
C_2H_3Cl 02B020
$C_2H_3Cl_3$ 02A280
$C_2H_3Cl_3$ 02A290
C_2H_3N 09A020
C_2H_4 01B020
$C_2H_4O_2$ 08A040
$C_2H_4Cl_2$ 02A260
$C_2H_4Cl_2O$ 04B020
C_2H_4O 07A040
$C_2H_4O_3$ 08B020
C_2H_5Cl 02A250
C_2H_5ClO 04A020
C_2H_5N 10B020
C_2H_5NO 08C040
C_2H_6 01A040
$C_2H_6N_2O$ 12A020
C_2H_6O 05A040
$C_2H_6S_2$ 13B080
C_2H_6SO 14B020
$C_2H_6O_2$ 06A020
C_2H_6S 13A040
C_2H_6S 13B020
C_2H_7N 10A040
C_2H_7N 10B040
C_2H_7NO 10A060
$C_2H_8N_2$ 10A080
$C_2H_8N_2$ 11B040
$C_2H_8N_2$ 11B060
$C_3H_2Cl_4O$ 07C020
C_3H_3N 09A040
C_3H_4 01C040
$C_3H_4Cl_2$ 02B100
C_3H_4O 07A060
$C_3H_4O_2$ 08B060
C_3H_5ClO 04A040
C_3H_5ClO 04A050
C_3H_5ClO 04A060
C_3H_5N 09A060

INDEX (Continued)

C_3H_6	01B040
$C_3H_6Cl_2$	02A340
C_3H_6O	07B020
C_3H_6O	07A080
$C_3H_6O_2$	06B020
$C_3H_6O_2$	08D020
C_3H_7N	10A110
C_3H_7ClO	04A080
C_3H_7ClO	04A100
C_3H_8	01A060
C_3H_8O	05A020
C_3H_8O	05A060
C_3H_8O	05B020
$C_3H_8O_2$	06A040
C_3H_8S	13A060
C_3H_9N	10A100
C_3H_9N	10B060
C_3H_9NO	10A120
C_4Cl_6	02B120
C_4H_4O	24A020
$C_4H_4O_4$	08A060
C_4H_4S	25A020
C_4H_5N	23C020
C_4H_6	01B080
C_4H_6	01C060
$C_4H_6O_3$	08B060
C_4H_7ClO	04A140
C_4H_7N	09A080
C_4H_8	01B060
$C_4H_8Cl_2O$	04B040
$C_4H_8Cl_2O$	04B060
$C_4H_8Cl_2O$	04B080
C_4H_8O	03A060
C_4H_8O	07A100
C_4H_8O	07B060
$C_4H_8O_2$	03B020
$C_4H_4O_2$	03B040
$C_4H_8O_2$	08B040
C_4H_9Br	02A360
C_4H_9ClO	04A120
C_4H_9NO	10B100
C_4H_{10}	01A080
$C_4H_{10}O$	05A080
$C_4H_{10}O$	05A100
$C_4H_{10}O$	05A080
$C_4H_{10}N_2O$	12A040
$C_4H_{10}O$	05C020
$C_4H_{10}O$	05B040
$C_4H_{10}S$	13A080
$C_4H_{10}S$	13B040
$C_4H_{11}N$	10A140
$C_4H_{11}N$	10B080
C_5H_4ClN	23A100
C_5H_5N	23A020
C_5Cl_6	02B140
C_5H_6	01B120
C_5H_6S	25A040
$C_5H_8O_2$	08D060
$C_5H_8O_2$	08D080
C_5H_{10}	01B100
C_5H_{10}	01A120
$C_5H_{10}O$	07A120
$C_5H_{10}O_2$	08A080
$C_5H_{10}O_2$	08D100
C_5H_{12}	01A100
$C_5H_{12}O$	05A120
$C_5H_{12}O$	05B060
$C_5H_{12}O$	05C040

INDEX (Continued)

C_6Cl_6 16A162
$C_6H_nCl_n$ 16A160
C_6HCl_5O 19A060
$C_6H_3Cl_3$ 16A161
$C_6H_3N_2O_7$ 20A120
C_6H_4BrCl 16A080
$C_6H_4Br_2$ 16A060
$C_6H_4ClNO_2$ 17B040
$C_6H_4ClNO_2$ 17B060
$C_6H_4Cl_2$ 16A100
$C_6H_4Cl_2$ 16A120
$C_6H_4Cl_2$ 16A140
$C_6H_4Cl_2O$ 19A040
$C_6H_4N_2O_5$ 20A100
C_6H_5Br 16A040
C_6H_5Cl 16A020
C_6H_5ClO 19A020
$C_6H_5NO_2$ 17A020
$C_6H_5NO_3$ 20A020
$C_6H_5NO_3$ 20A040
$C_6H_5NO_3$ 20A060
$C_6H_5N_3O_5$ 20A080
C_6H_6 15A020
$C_6H_6Cl_6$ 02A380
C_6H_6O 18A020
$C_6H_6O_2$ 18B020
$C_6H_6O_2$ 18B040
$C_6H_6O_2$ 18B060
$C_6H_6O_3$ 18B080
$C_6H_6SO_3$ 14A020
C_6H_6 13A100
C_6H_7N 10C020
C_6H_7N 23A040
C_6H_8 01B180
$C_6H_8N_2$ 10C100
$C_6H_8N_2O$ 09A100
C_6H_8S 25A060
C_6H_{10} 01B160
$C_6H_{10}O_2$ 08A101
$C_6H_{10}O_4$ 08A180
$C_6H_{11}NO$ 08C060
C_6H_{12} 01A160
C_6H_{12} 01B140
$C_6H_{12}O_2$ 03B060
$C_6H_{12}O_2$ 08D120
$C_6H_{12}Cl_2O$ 04B100
$C_6H_{13}ClO$ 04A160
$C_6H_{13}N$ 10A160
$C_6H_{13}NO_2$ 08B100
C_6H_{14} 01A140
$C_6H_{14}N_2O$ 12A060
$C_6H_{14}N_2O$ 12A080
$C_6H_{14}O$ 03A020
$C_6H_{15}O_4P$ 26A020
C_7H_5N 09B020
C_7H_5NS 23D020
$C_7H_6N_2O_4$ 17A080
$C_7H_6N_2O_5$ 20B020
$C_7H_6N_2O_5$ 20B040
C_7H_6O 07A140
$C_7H_6O_2$ 08A160
$C_7H_6O_3$ 08B040
C_7H_7Cl 16A180
C_7H_7Cl 16B020
C_7H_7ClO 19B020
$C_7H_7NO_2$ 17A040

INDEX (Continued)

$C_7H_7NO_3$ 17B020
C_7C_8 15A040
$C_7H_8N_2O$ 12B020
C_7H_8O 05A140
C_7H_8O 18A040
$C_7H_8O_2$ 18A060
C_7H_9N 10C040
C_7H_9N 23A141
C_7H_9N 23A142
C_7H_9N 23A143
C_7H_9N 23A144
C_7H_9N 23A145
C_7H_9N 23A061
C_7H_9N 23A062
C_7H_9N 23A063
C_7H_9NO 10C080
$C_7H_{10}S$ 25A081
C_7H_{14} 01B200
$C_7H_{14}O_2$ 08D140
C_7H_{16} 01A180
C_8H_6O 24A040
$C_8H_6O_4$ 08A200
C_8H_6S 25B040
$C_8H_6S_2$ 25B020
C_8H_7N 23C040
C_8H_7NS 23D040
$C_8H_8Cl_2$ 16B040
$C_8H_8O_2$ 07B120
$C_8H_8O_2$ 08D160
C_8H_{10} 15B080
C_8H_{10} 15A060
$C_8H_{10}N$ 05A160
$C_8H_{10}O$ 05B100
$C_8H_{10}O$ 18A080
$C_8H_{10}N$ 18A140
$C_8H_{11}N$ 10C060
$C_8H_{11}N$ 10D020
$C_8H_{11}N$ 23A120
$C_8H_{11}N$ 23A064
C_8H_{12} 15A080
$C_8H_{12}N_2$ 09A120
$C_8H_{16}Cl_2O$ 04B120
$C_8H_{16}O_2$ 08A102
$C_8H_{17}Cl$ 02A400
C_8H_{18} 01A200
C_9H_7N 23B020
C_9H_8 22A010
C_9H_8O 24A060
C_9H_9N 23C060
C_9H_{10} 15B020
$C_9H_{10}O$ 18C080
C_9H_{12} 15B180
C_8H_{12} 15A100
C_9H_{12} 15A120
C_9H_{12} 15B180
$C_9H_{12}O$ 18A160
$C_9H_{12}O$ 18A181
$C_9H_{13}N$ 23A146
$C_9H_{14}O$ 07B080
C_9H_{20} 01A220
$C_9H_{20}O$ 05B080
$C_{10}H_7Cl$ 16A200
$C_{10}H_8$ 21A020
$C_{10}H_8O$ 18C020
$C_{10}H_8O$ 18C040
$C_{10}H_9N$ 10C200
$C_{10}H_9N$ 10C220
$C_{10}H_9N$ 23B040

INDEX (Continued)

$C_{10}H_{10}$ 15B140
$C_{10}H_{10}O_4$ 08D281
$C_{10}H_{12}$ 01B220
$C_{10}H_{12}$ 15B120
$C_{10}H_{14}$ 15A140
$C_{10}H_{14}$ 15B101
$C_{10}H_{14}$ 15B102
$C_{10}H_{14}$ 15B103
$C_{10}H_{14}$ 15B200
$C_{10}H_{14}O$ 07B181
$C_{10}H_{16}O$ 07B100
$C_{10}H_{16}O$ 07B182
$C_{10}H_{18}O$ 05B120
$C_{10}H_{18}O$ 05B140
$C_{10}H_{18}O$ 05C060
$C_{10}H_{18}O_4$ 08D200
$C_{10}H_{20}O_2$ 08A103
$C_{10}H_{22}$ 01A240
$C_{10}H_{22}N_2O$ 12A100
$C_{11}H_7N$ 09B040
$C_{11}H_7O_2$ 18C140
$C_{11}H_9N$ 23A080
$C_{11}H_{10}$ 21A040
$C_{11}H_{10}$ 21A042
$C_{11}H_{11}N$ 23B060
$C_{11}H_{24}$ 01A242
$C_{12}Cl_n$ 16A220
$C_{12}H_8$ 21A100
$C_{12}H_8O$ 24B020
$C_{12}H_8O$ 24B040
$C_{12}H_8S$ 25B060
$C_{12}H_9BrO$ 04A200
$C_{12}H_9ClO$ 04A180
$C_{12}H_9N$ 23C080
$C_{12}H_9NO_2$ 17A060
$C_{12}H_{10}$ 15A160
$C_{12}H_{10}$ 21A100
$C_{12}H_{10}ClN$ 10C160
$C_{12}H_{10}N_2O$ 12B040
$C_{12}H_{10}O$ 18A100
$C_{12}H_{10}O$ 18C100
$C_{12}H_{10}O_2$ 18A120
$C_{12}H_{10}S$ 13B060
$C_{12}H_{11}N$ 10C120
$C_{12}H_{12}$ 21A043
$C_{12}H_{12}$ 21A044
$C_{12}H_{12}$ 21A080
$C_{12}H_{12}N_2$ 10C140
$C_{12}H_{12}N_2$ 11B080
$C_{12}H_{14}O_4$ 08D282
$C_{12}H_{18}$ 15B104
$C_{12}H_{18}$ 15B105
$C_{12}H_{26}$ 01A260
$C_{13}H_9ClO_2$ 07C040
$C_{13}H_9N$ 23B080
$C_{13}H_9N$ 23B120
$C_{13}H_9N$ 23B140
$C_{13}H_9N$ 23B160
$C_{13}H_{10}$ 22A020
$C_{13}H_{10}O$ 18C120
$C_{13}H_{10}O_2$ 08D180
$C_{13}H_{11}N$ 23B100
$C_{13}N_{11}N$ 23C100
$C_{13}H_{12}$ 22A040
$C_{13}H_{12}Cl_2N_2$ 10C180
$C_{13}H_{12}O$ 03A040
$C_{14}H_8C_8S_2$ 14A040
$C_{14}H_{10}$ 21A140

INDEX (Continued)

$C_{14}H_{10}$ 21A180
$C_{14}H_{10}O$ 18C060
$C_{14}H_{10}S$ 13A120
$C_{14}H_{15}N_3$ 11A040
$C_{14}H_{22}$ 15B106
$C_{14}H_{22}O$ 18A182
$C_{14}H_{26}O_4$ 08D220
$C_{14}H_{28}O_2$ 08A121
$C_{15}H_9N$ 23B300
$C_{15}H_{10}$ 22B080
$C_{15}H_{12}$ 21A201
$C_{15}H_{24}O$ 18A183
$C_{16}H_{10}$ 22B040
$C_{16}H_{10}$ 21B180
$C_{16}H_{10}O$ 24B060
$C_{16}H_{10}O$ 24B080
$C_{16}H_{10}O$ 24B100
$C_{16}H_{10}S$ 25B080
$C_{16}H_{11}N$ 23C120
$C_{16}H_{11}N$ 23B280
$C_{16}H_{12}$ 21A060
$C_{16}H_{14}$ 21A160
$C_{16}H_{22}O_4$ 08D283
$C_{16}H_{32}O_2$ 08A122
$C_{17}H_{11}N$ 23B180
$C_{17}H_{11}N$ 23B200
$C_{17}H_{12}$ 21B200
$C_{17}H_{12}$ 22B020
$C_{17}H_{12}$ 22B060
$C_{17}H_{12}O$ 07B160
$C_{18}H_{12}$ 21B040
$C_{18}H_{12}$ 21B101
$C_{18}H_{12}$ 21B120
$C_{18}H_{14}$ 15B160
$C_{18}H_{14}$ 21B220
$C_{18}H_{15}O_4P$ 26B020
$C_{18}H_{34}O_2$ 08A140
$C_{18}H_{34}O_4$ 08D240
$C_{18}H_{36}O_2$ 08A123
$C_{19}H_{14}$ 21B102
$C_{19}H_{14}$ 21B103
$C_{19}H_{14}$ 21B104
$C_{19}H_{14}$ 21B105
$C_{19}H_{14}$ 21B106
$C_{19}H_{14}$ 21B107
$C_{19}H_{14}$ 21B140
$C_{19}H_{20}O_4$ 08D320
$C_{20}H_{12}$ 22C020
$C_{20}H_{12}$ 22C040
$C_{20}H_{12}$ 22C080
$C_{20}H_{12}$ 21C100
$C_{20}H_{12}$ 21C120
$C_{20}H_{12}$ 21C140
$C_{20}H_{13}N$ 23C140
$C_{20}H_{13}N$ 23C160
$C_{20}H_{13}N$ 23C180
$C_{20}H_{16}$ 21B060
$C_{20}H_{17}$ 21B108
$C_{20}H_{17}$ 21B109
$C_{21}H_{13}N$ 23B220
$C_{21}H_{13}N$ 23B240
$C_{21}H_{13}N$ 23B260
$C_{21}H_{14}$ 22C060
$C_{21}H_{16}$ 21B080
$C_{21}H_{18}$ 21B10A
$C_{21}H_{18}$ 21B10B
$C_{21}H_{21}O_4P$ 26B040
$C_{22}H_{12}$ 21D080

INDEX (Continued)

$C_{22}H_{12}$ 22D020
$C_{22}H_{14}$ 21C020
$C_{22}H_{14}$ 21C040
$C_{22}H_{14}$ 21C060
$C_{22}H_{14}$ 21C080
$C_{22}H_{14}$ 21C160
$C_{22}H_{42}O_2$ 08D260
$C_{24}H_{12}$ 21D100
$C_{24}H_{14}$ 21D020
$C_{24}H_{14}$ 21D040
$C_{24}H_{14}$ 21D060
$C_{24}H_{20}$ 15B060
$C_{24}H_{38}O_4$ 08D300
$C_{27}H_{18}$ 22D040

APPENDIX A

MEG CHARTS AND BACKGROUND INFORMATION SUMMARIES

Appendix A of the MEG's report consists of background information summaries and MEG charts for organic compounds included in the MEG's Master List and is contained in this volume and in Volume IV. The charts and summaries are arranged by MEG's categories. Categories 1 through 12 are included in this volume; Categories 13-26 are in Volume IV (the distinguishing characteristics of each of the MEG's categories are discussed in Volume IA, Appendix B).

Charts and summaries contained in this appendix address 586 organic chemicals. At the beginning of each subcategory of compounds, a brief tabulation is provided giving the number of compounds addressed in the subcategory, the number of suspected carcinogens or teratogens included, the number of compounds without numerical MEG's, and the specific Consent Decree compounds included. A separate reference list is supplied for each subcategory allowing the user to ascertain quickly if a particular reference has been used in the preparation of the summaries for a compound group. The consolidated alphabetized bibliography for the background information summaries is given in Appendix F, contained in Volume IA.

An alphabetical index of preferred names and synonyms for the organic MEG compounds and a molecular formula index are included in the front matter of each volume containing Appendix A.

The methodology developed for establishing Multimedia Environmental Goals as outlined in Volume IA has been applied in the preparation of the background information summaries and MEG charts contained in this appendix.

CATEGORY 1

ALIPHATIC HYDROCARBONS

SUBCATEGORY: 1A - Alkanes and Cyclic Alkanes

Summary of Subcategory

Total number of compounds in subcategory	21
number of parent compounds with subspecies	7
number of subspecies	15
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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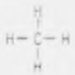
CATEGORY: 1A

WLN: 1H

METHANE: CH_4 (marsh gas, methyl hydride). 01A020
A colorless, odorless, flammable, tasteless gas.

STRUCTURE:



$$\begin{array}{ccc} & H & \\ & | & \\ H- & C & -H \\ & | & \\ & H & \end{array}$$

PROPERTIES:

Molecular wt: 16.04; mp: -182.48; bp: -161^{760};
d: 0.466^{164} to 0.5547; soluble; vap. d: 0.6;
vap. press.: 1 atm at -161.5°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural background concentration in air is reported as 1.2 to 2.0 ppm (ref. 1). This is equivalent to 780 to 1,000 $\mu g/m^3$. Methane does not participate appreciably in photooxidation reactions.

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic effects are reported for exposed workers.

Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 2).

Toxicity to vegetation: No adverse effects on plants were observed with methane concentrations as high as 6.53×10^5 $\mu g/m^3$ (1,000 ppm) (ref. 16).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Classified as a simple asphyxiant by ACGIH.
TLV_{SA} = 5,000 ppm or 3,270 mg/m^3.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.27×10^6 $\mu g/m^3$ (5,000 ppm)
Water, Health: $15 \times 3.27 \times 10^6 = 4.9 \times 10^7$ $\mu g/l$
Land, Health:

Air, Ecology: 6.5×10^6 $\mu g/m^3$ (10,000 ppm)
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 3,270/420 = 7,800$ $\mu g/m^3$
$EPC_{AH1a} = 5,000/420 = 11.9$ ppm
$EPC_{WH1} = 15 \times 7,800 = 1.17 \times 10^5$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 3,270 = 4.5 \times 10^4$ $\mu g/l$

$EPC_{AE} = 6.5 \times 10^5$ $\mu g/m^3$ (1,000 ppm)

$EPC_{WE1} = 50 \times >1,000 = >50,000$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01A020
METHANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.3E6 (5,000)	6.5E6 (1×10^4)	7,800 (12)	650,000	780-1,000
Water, μg/l (ppm Wt)			4.9E7	1.0E5	45,000	50,000	
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			7,800 (12)	650,000 (1,000)	
Water, μg/l (ppm Wt)			45,000	50,000	
Land, μg/g (ppm Wt)					

CATEGORY: 1A

WLN:

ETHANE: C_2H_6 (bimethyl, methylmethane, dimethyl, ethyl hydride). 01A040

A colorless, flammable, odorless gas.

STRUCTURE:

$H_3C\text{-}CH_3$

PROPERTIES:

Molecular wt: 30; mp: -172; bp: -88.6; d: 0.572_4^{-108};
vap. d: 1.04; slightly soluble; vap. press.: 760 mm at -88.6°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural concentration in air is reported as 3.6 ppbc (ref. 1). This is equivalent to 2.2 $\mu g/m^3$. Ethane participates to a very limited extent in photooxidation reactions (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic effects are reported for exposed workers.

Toxicity to vegetation: No adverse effects on plants were observed with ethane concentrations as high as 1.22×10^6 $\mu g/m^3$ (1,000 ppm) (ref. 16).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Classified by ACGIH as a simple asphyxiant.

TLV_{SA} = 5,000 ppm or 6,122 mg/m^3

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 6.12×10^6 $\mu g/m^3$ (5,000 ppm)
Water, Health: $15 \times 6.12 \times 10^6 = 9.2 \times 10^7$ $\mu g/l$
Land, Health:

Air, Ecology: 1.22×10^7 $\mu g/m^3$ (10,000 ppm)
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 6{,}122/420 = 14{,}600$ $\mu g/m^3$
$EPC_{AH1a} = 5{,}000/420 = 11.9$ ppm
$EPC_{WH1} = 15 \times 14{,}600 = 2.2 \times 10^5$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 6{,}122 = 8.4 \times 10^4$ $\mu g/l$

$EPC_{AE} = 1.22 \times 10^6$ $\mu g/m^3$ (1,000 ppm)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.1E6 (5,000)	1.2E7 ($1\text{x}10^4$)	14,600 (12)	$1.2\text{x}10^6$ (1,000)	2.2
Water, $\mu g/l$ (ppm Wt)			9.2E7		84,000		
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			14,600 (12)	$1.2\text{x}10^6$ (1,000)	
Water, $\mu g/l$ (ppm Wt)			84,000		
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 1A

WLN: 3H

PROPANE: C_3H_8 (dimethylmethane). 01A060
A colorless, flammable gas.

STRUCTURE:

$CH_3CH_2CH_3$

PROPERTIES:

Molecular wt: 44.09; bp: -42.1; d: $0.5854^{-44.5}$;
vap. d: 1.56; slightly soluble; vap. press.: 760 mm at -42.1°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural background concentration in air is reported as 1.4 to 8.4 ppbc (ref. 1). This is equivalent to 0.84 to 5.0 $\mu g/m^3$.

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic properties are reported for exposed workers.

Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 2).

Toxicity to vegetation: No adverse effects on plants were observed with propane concentrations as high as 1.30×10^6 $\mu g/m^3$ (1,000 ppm) (ref. 16).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Classified by ACGIH as a simple asphyxiant.
TLV_{SA} = 5,000 ppm or 9,000 mg/m^3.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 9.00×10^6 $\mu g/m^3$ (5,000 ppm)
Water, Health: $15 \times 9.0 \times 10^6 = 1.35 \times 10^8$ $\mu g/l$
Land, Health:

Air, Ecology: 1.8×10^7 $\mu g/m^3$ (10,000 ppm)
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 9,000/420 = 21,400$ $\mu g/m^3$
$EPC_{AH1a} = 5,000/420 = 11.9$ ppm
$EPC_{WH1} = 15 \times 21,400 = 3.2 \times 10^5$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 9,000 = 1.2 \times 10^5$ $\mu g/l$

$EPC_{AE} = 1.8 \times 10^6$ $\mu g/m^3$ (1,000 ppm)

$EPC_{WE1} = 50 \times >1,000 = >50,000$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01A060
PROPANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			9.0E6 (5,000)	1.8E7 ($1x10^4$)	21,400 (12)	$1.8x10^6$ (1,000)	0.84-5.0
Water, $\mu g/l$ (ppm Wt)			1.4E8	1.0E5	120,000	50,000	
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			21,400 (12)	$1.8x10^6$ (1,000)	
Water, $\mu g/l$ (ppm Wt)			120,000	50,000	
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 1A

WLN: 4H

BUTANES: C_4H_{10} 01A080

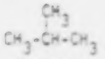
- n-BUTANE: 01A081
- ISOBUTANE: (trimethylmethane, 2-methylpropane). 01A082

Colorless gas; faint disagreeable odor.

STRUCTURE:

CH_3-CH_2-CH_2-CH_3

n-butane



$$CH_3\text{-}\overset{CH_3}{\overset{|}{C}H}\text{-}CH_3$$

isobutane

PROPERTIES:

n-butane: mol. wt: 58.1; bp: -0.1; d: 0.599;
vap. press: 2 atm at 18.8°; vap. d: 2.046; soluble.
isobutane: mol. wt.: 58.1; bp: -0.5; d: 0.557;
vap. press: 760 mm at -11.7°; vap. d: 2.01; soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Participation in photooxidation reactions is extremely limited (ref. 3). Isobutane is more reactive than n-butane and forms isobutyl and tertiary butyl radicals. Rural background concentration is reported as 1.1 to 19.5 ppbc for n-butane (ref. 1). This is equivalent to 0.65 to 11.5 $\mu g/m^3$. A level of 0.8 ppb isobutane is reported in urban atmosphere (ref. 1). This is equivalent to 1.8 $\mu g/m^3$. The odor detection limit for butanes is 5,000 ppm (ref. 4).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

Exposure to high concentrations of butane produces narcosis (ref. 4).

LD_{50} (oral, rat) for n-butane: 658 mg/m^3 (24 hours).

Aquatic toxicity for n-butane: TLm 96: > 1,000 ppm (ref. 2).

Toxicity to vegetation: No adverse effects on plants were observed with butane and isobutane concentrations as high as 2.37×10^6 $\mu g/m^3$ (1,000 ppm) (ref. 16).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,400 mg/m^3 (600 ppm) for n-butane

Classified by ACGIH as a simple asphyxiant.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.40×10^6 $\mu g/m^3$ (600 ppm)
Water, Health: $15 \times 1.4 \times 10^6 = 2.1 \times 10^7$ $\mu g/l$
Land, Health:

Air, Ecology: 2.4×10^7 $\mu g/m^3$ (10,000 ppm)
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1.400/420 = 3,450$ $\mu g/m^3$
$EPC_{AH1a} = 600/420 = 1.43$ ppm
$EPC_{WH1} = 15 \times 3,450 = 52,000$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 1,400 = 19,000$ $\mu g/l$

$EPC_{AE} = 2.4 \times 10^6$ $\mu g/m^3$ (1,000 ppm)

$EPC_{WE1} = 50 \times >1,000 = >50,000$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01A080
BUTANES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.4E6 (600)	2.4E7 (1×10^4)	3,450 (1.4)	2.4×10^6 (1,000)	0.65-11.5
Water, μg/l (ppm Wt)			2.1E7	1.0E5	19,000	50,000	
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			3,450 (1.4)	2.4×10^6 (1,000)	
Water, μg/l (ppm Wt)			19,000	50,000	
Land, μg/g (ppm Wt)					

CATEGORY: 1A

PENTANES: C_5H_{12} 01A100

n-PENTANE: (amyl hydride). Colorless liquid, flammable. 01A101

ISOPENTANE: (2-methylbutane, u-isoamyl hydride, ethyldimethylmethane). Colorless liquid, pleasant odor, flammable. 01A102

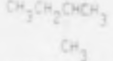
NEOPENTANE: (2,2-dimethylpropane, tetramethylmethane). Gas or liquid. 01A103

WLN/STRUCTURE:

5H / $CH_3(CH_2)_3CH_3$

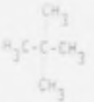
n-pentane

5Y /



$CH_3CH_2CH(CH_3)CH_3$

isopentane



$H_3C\text{-}C(CH_3)_2\text{-}CH_3$

neopentane

PROPERTIES:	molecular wt	mp	bp	d	solubility	vap. press.	vap. d
n-pentane	72.15	-129.7	36.1	0.626	slightly	400 mm at 18.5°C	2.48
isopentane	72.15	-159.9	27.9	0.620	insoluble	595 mm at 21.1°C	2.48
neopentane	72.15	- 16.6	9.5	0.614	insoluble	1,100 mm at 21°C	2.48

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Pentanes are present in petroleum (refs. 5,6).

Concentration in rural atmosphere is reported as 0.9 to 9.4 ppbc for n-pentane (ref. 1). This is equivalent to 0.53 to 5.54 µg/m³. Concentration is reported as 1.4 to 23.9 ppbc for isopentane (ref. 1). This is equivalent to 0.82 to 14.1 µg/m³. n-Pentane has been found in samples from public drinking water supplies in four U.S. cities (ref. 7).

Isopentane is one of the major hydrocarbon fuel components in auto exhaust. Along with n-butane, isopentane accounts for the major portion of all gasoline evaporation losses from carburators and fuel tanks (ref. 8).

The odor detection limit for n-pentane is 1,000 ppm (ref. 9). Explosion hazard is severe when exposed to heat or flame. Pentane may be explosive in air in the range of 1.4 to 8.0 percent by volume (ref. 5).

Pentane is often prepared by dehydration and subsequent hydrogenation of 2- and 3-pentanol.

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

Exposure to high concentrations of n-pentane produces narcosis (ref. 5). Concentration of n-pentane of 5,000 ppm for 10 min with humans did not cause mucous membranes irritation (ref. 8). Narcosis was produced in humans after 5 to 60 min at 90,000 to 120,000 ppm (ref. 9). The lethal concentration of n-pentane for mice in air is reported as 128,200 ppm (ref. 6).

Aquatic toxicity:

TLm 96 = 100 - 10 ppm for n-pentane; 1,000 - 100 ppm for isopentane (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,800 mg/m³ (600 ppm) for n-pentane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 µg/m³ (120 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ µg/l

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ µg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ µg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ µg/m³

$EPC_{AH1a} = 120/420 = 0.3$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ µg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000$ µg/g

$EPC_{WE1} = 50 \times 10 = 500$ µg/l

$EPC_{LE} = 0.2 \times 500 = 100$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01A100
PENTANES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.5E5 (120)		833 (0.3)		0.53-14.1
Water, μg/l (ppm Wt)			5.3E6	1.0E3	4,830	500	
Land, μg/g (ppm Wt)			1.1E6	2.0E2	966	100	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			833 (0.3)		
Water, μg/l (ppm Wt)			4,830	500	
Land, μg/g (ppm Wt)			966	100	

CATEGORY: 1A

CYCLOPENTANE: $(CH_2)_5$ (pentamethylene) 01A120
A colorless liquid, flammable.

WLN: L5TJ

STRUCTURE:

PROPERTIES:

Molecular wt: 70.14; mp: -93.879; bp: 49.262^{760}; d: 0.7457_4^{20}; vap. press: 400 mm at 31.0° C; vap. d: 2.42; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cyclopentane is present in petroleum (ref. 5).

Concentration in rural atmosphere is reported as 0.3 to 2.4 ppbc (ref. 1). This is equivalent to 0.17 to 1.37 μg/m³. Cyclopentane has been found in samples from public drinking water supplies (ref. 11).

Cyclopentane is used as a solvent and as a starting material for synthesis in the chemicals industry (ref. 12).

TOXIC PROPERTIES, HEALTH EFFECTS:

Exposure to high concentrations of cyclopentane produces narcosis (ref. 12).

The lethal concentration of cyclopentane for mice in air is reported as 38,000 ppm (ref. 6). This indicates the compound may be 3 or 4 times more toxic than n-pentane (lethal concentration = 128,200 ppm for mice) (ref. 6).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,800 mg/m³ (600 ppm) for n-pentane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air Health: 3.5×10^5 μg/m³ (120 ppm)

Water, Health: $3.5 \times 10^5 = 5.3 \times 10^5$ μg/l

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ μg/g

Air, Ecology

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ μg/m³

$EPC_{AH1a} = 120/420 = 0.3$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ μg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000$ μg/g

$EPC_{WE1} = 50 \times >1{,}000 = 5.0 \times 10^4$ μg/l

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01A120
CYCLOPENTANE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.5E5 (120)		833 (0.3)		0.17-1.37
Water, μg/l (ppm Wt)			5.3E6	1.0E5	4,830	50,000	
Land, μg/g (ppm Wt)			1.1E6	2.0E4	966	10,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			833 (0.3)		
Water, μg/l (ppm Wt)			4,830	50,000	
Land, μg/g (ppm Wt)			966	10,000	

CATEGORY: 1A

HEXANES: C_6H_{14} 01A140

n-HEXANE: (dipropyl, hexyl hydride). A colorless, very volatile, flammable liquid, with a faint, characteristic odor.

ISOHEXANE: (2-methylpentane). A liquid. 01A142

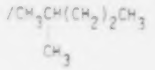
WLN:

STRUCTURE:

01A141

6H/$CH_3(CH_2)_4CH_3$

n-hexane


/$CH_3CH(CH_2)_2CH_3$ with CH_3 on the CH

isohexane

PROPERTIES:

n-hexane: mol. wt: 86.18; bp: 68.95^{760}; mp: -95; d: 0.6603_4^{20} vap. d: 2.97; vap. press: 100 mm at 15.8°C; insoluble in water.

isohexane: mol. wt: 86.18; bp: 60.271^{760}; mp: -153.67; d: 0.6532_4^{20}; vap. d: 3.00; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

n-Hexane is a chief constituent of petroleum ether or ligroin (ref. 6). It is used in determining the refractive index of minerals, in filling thermometers instead of using mercury (ref. 6), and as a food additive in food for human consumption (ref. 5).

The concentration of n-hexane in rural atmosphere is 0.6 to 4.2 ppbc (ref. 1). This is equivalent to 0.35 to 2.46 μg/m³.

Various isomers of n-hexane are major components of petroleum ether and other volatile petroleum solvents (ref. 4).

Both n-hexane and isohexane may explode when exposed to heat or flame. n-Hexane may be flammable in air in the range of 1.18 to 7.43 percent by volume (ref. 9).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-Hexane is irritating to the respiratory tract, and in high concentrations produces narcosis (ref. 6). At 500 ppm there was no irritation to humans (ref. 4). At a concentration of 5,000 ppm for 10 min, human subjects experienced dizziness and giddiness. Slight nausea, headache, and eye and throat irritation were reported at a concentration of 1,400 to 1,500 ppm (ref. 8).

Inhalation of 34,000 ppm may be letnal to mice (ref. 2).

Aquatic toxicity: for n-hexane: TLm 96: >1,000 ppm (ref. 2).
for isohexane: TLm 96: >1,000 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 350 mg/m³ (100 ppm) for n-hexane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	3.50×10^5 μg/m³ (100 ppm)	Air, Ecology:	
Water, Health:	$15 \times 3.5 \times 10^5 = 5.25 \times 10^6$ μg/l	Water, Ecology:	$100 \times >1,000 = >1.0 \times 10^5$ μg/l
Land, Health:	$0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ μg/g	Land, Ecology:	$0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ μg/m³

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ μg/l

$EPC_{WE1} = 50 \times >1,000 = >5 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 350 = 4,830$ μg/g

$EPC_{LH} = 0.2 \times 4,830 = 1,000$ μg/g

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ μg/g

01A140
HEXANES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (100)		833 (0.24)		0.35-2.46
Water, $\mu g/l$ (ppm Wt)			5.3E6	1.0E5	4,830	50,000	
Land, $\mu g/g$ (ppm Wt)			1.1E6	2.0E4	966	10,000	

*To be multiplied by dilution factor

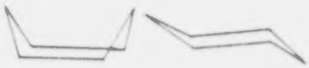
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.24)		
Water, $\mu g/l$ (ppm Wt)			4,830	>50,000	
Land, $\mu g/g$ (ppm Wt)			966	10,000	

CATEGORY: 1A

CYCLOHEXANE: C_6H_{12} (hexahydrobenzene, hexamethylene, hexanaphthene). A colorless, flammable liquid with a pungent odor. Can exist in two interconvertible conformations, the boat and the chair. 01A160

WLN: L6TJ

STRUCTURE:



PROPERTIES:

Molecular wt: 84.16; mp: 6.55; bp: 80.74; d:0.77855_4^{20}; vap. d. 2.90; vap. press: 100 mm at 60.8° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cyclohexane occurs in petroleum (ref. 6).

Concentration in rural atmosphere is reported as <1 ppbc (ref. 1). This is equivalent to $<0.05\ \mu g/m^3$ Cyclohexane has been found in samples from public drinking water supplies (ref. 11).

Cyclohexane can be formed by hyrdogenation of benzene or in the distillation of petroleum (ref. 6). It is used in solvents for lacquers and resins, in paint and varnish remover; in extraction of essential oils; in manufacturing of adipic acid, benzene, cyclohexyl chloride, nitrocyclohexane, cyclohexanol, and cyclohexanone; in the manufacture of solid fuel for camp stoves; and in fungicidal formulations (ref. 6).

Cyclohexane in air can be detected with nonspecific methods for hydrocarbon analysis, including combustible gas indicator, interferometer, spectrometer, infrared absorption, gas chromatography, and combustion to CO_2 (ref. 12).

Odor threshold is 300 ppm (ref. 4).

Cyclohexane vapor can be explosive when exposed to flame (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

Cyclohexane may act as a simple asphyxiant; in high concentrations it may produce narcosis (refs. 5, 6). At 300 ppm it is irritating to the eyes and mucous membranes (ref. 4). A small fraction of inhaled cyclohexane is exhaled, and a portion is excreted in the urine unchanged. Cyclohexane that enters the blood is excreted in the urine in the form of glucuronides and ethereal sulfates (ref. 12).

Acute toxicity studies with animals indicated that inhalation of 26,600 ppm caused death with rabbits after 1 hr. An atmospheric concentration of 12,600 ppm produced evidence of lethargy, narcosis, increased respiration rate, and convulsions. Exposure to 3,330 ppm caused no visible effects in rabbits (ref. 12).

Chronic toxicity is believed to be of little concern on the basis of animal studies (ref. 12).

LD_{50} (oral, mouse): 1,297 mg/kg (ref. 2).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,050 mg/m^3 (300 ppm)

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m^3 as a time weighted average. A ceiling of 1,800 mg/m^3 determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $3.5 \times 10^5\ \mu g/m^3$ (100 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.3 \times 10^6\ \mu g/l$

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000\ \mu g/l$

Land, Ecology: $0.2 \times 1{,}000 = 200\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833\ \mu g/m^3$

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4\ \mu g/l$

$EPC_{WH2} = 13.8 \times 350 = 4{,}830\ \mu g/l$

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/l$

$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

01A160
CYCLOHEXANE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.5E5 (100)		833 (0.24)		<0.05
Water, μg/l (ppm Wt)			5.3E6	1.0E3	4,830	500	
Land, μg/g (ppm Wt)			1.1E6	2.0E2	966	100	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			833 (0.24)		
Water, μg/l (ppm Wt)			4,830	500	
Land, μg/g (ppm Wt)			966	100	

CATEGORY: IA

HEPTANES: C_7H_{16} 01A180

n-HEPTANE: (heptyl hydride, dipropyl methane). A volatile, flammable liquid. 01A181

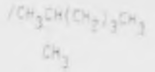
ISOHEPTANE: (2-methylhexane, ethylisobutylmethane). A colorless, flammable liquid. 01A182

WLN:

STRUCTURE:

$7H/CH_3(CH_2)_5CH_3$

n-heptane



$/CH_3CH(CH_2)_3CH_3$ with CH_3 below

isoheptane

PROPERTIES:

n-heptane: mol. wt: 100.21; mp: -90.61; bp: 98.42^{760}; d: 0.68376^{20}_{4}; vap. d: 3.45; vap. press: 40 mm at 22.3° C; insoluble in water.

isoheptane: mol. wt: 100.21; mp: -118.2; bp: 90.0^{760}; d: 0.6789^{20}_{4}; vap. d: 3.45; vap. press: 40 mm at 14.9° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Heptanes occur in petroleum (ref. 6). Heptane is used as a standard in testing knock of gasoline engines (ref. 6).

Concentration in rural atmosphere is reported as 1.5 to 3.4 ppbc for n-heptane (ref. 1). This is equivalent to 0.88 to 1.99 µg/m³. Concentration for isoheptane is reported as 0.7 to 0.9 ppbc (ref. 1), 0.41 to 0.53 µg/m³.

Heptanes in air can be detected with portable electrical devices, including combustible gas indicators. Also, interferometer, gas chromatograph, and the Haldane or Orzat gas apparatus may be used (ref. 9).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-heptane is irritating to the respiratory tract; in high concentrations it can produce narcosis, and it is a central nervous system irritant (ref. 5).

Studies of toxicity to humans indicated that at 1,000 ppm, n-heptane caused dizziness after 6 min of exposure. Concentrations greater than 1,000 ppm for less than 6 min produced vertigo, incoordination, and hilarity. Nausea, appetite loss, and a gasoline taste were reported as a result of brief exposure to high levels (5,000 ppm). Fatal concentration is reported as 16,000 ppm (ref. 4).

Exposure to n-heptane at 15,000 ppm for 30 min. may be lethal to mice (ref. 4).

Aquatic toxicity: TLm 96 for n-heptane: over 1,000 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 2,000 mg/m³ (400 ppm) for n-heptane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 µg/m³ (85 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ µg/l

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ µg/g

Air, Ecology:

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ µg/l

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ µg/m³

$EPC_{AH1a} = 85/420 = 0.2$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ µg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000$ µg/g

$EPC_{WE1} = 50 \times >1{,}000 = >5.0 \times 10^4$ µg/l

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01A180
HEPTANES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (85)		833 (0.2)		0.41-1.99
Water, $\mu g/l$ (ppm Wt)			5.3E6	1.0E5	4,830	50,000	
Land, $\mu g/g$ (ppm Wt)			1.1E6	2.0E4	966	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.2)		
Water, $\mu g/l$ (ppm Wt)			4,830	50,000	
Land, $\mu g/g$ (ppm Wt)			966	10,000	

CATEGORY: 1A

OCTANES: C_8H_{18} 01A200

n-OCTANE: A clear, flammable liquid. 01A201

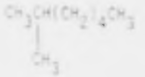
ISOOCTANE: (2,2,4-trimethylpentane, 2-methylheptane). A liquid; gasoline odor. 01A202

WLN:

STRUCTURE:

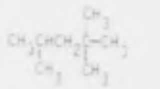
$8H/CH_3(CH_2)_6CH_3$

n-octane



$CH_3CH(CH_2)_4CH_3$ with CH_3 on the second carbon

Isooctane (2-Methylheptane)



$CH_3CHCH_2C(CH_3)_2CH_3$ with CH_3 on C-2

Isooctane (2,2,4-trimethylpentane)

PROPERTIES:

n-octane: mol. wt: 114.2; mp: -56.79; bp: 125.66^{760}; d: 0.7025$^{20}_{4}$; vap. d: 3.86; vap. press: 10 mm at 19.2° C; insoluble in water

isooctane: mol. wt: 114.2; mp: -107.38; bp: 99.238^{760}; d: 0.6919$^{20}_{4}$; vap. d: 3.93; vap press: 40.6 mm at 21° C; insoluble in water

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Octanes occur in petroleum (ref. 6). Octane is used in petroleum naptha, gasoline, and mineral spirits (ref. 9). Isooctane has been used in determining octane numbers of fuels, and as a solvent and thinner (ref. 6).

Urban atmosphere concentration of n-octane is 3.4 ppb (ref. 1). This is equivalent to 15.8 $\mu g/m^3$. Urban atmosphere concentration of isooctane is also reported as 3.4 ppb (ref. 1).

Octanes in air can be detected with combustible gas indicators, interferometer, gas chromatographic analysis, and the Haldane or Orsat gas apparatus (ref. 9).

n-Octane has been found in samples taken from groundwater and from finished drinking water supplies (ref. 11).

n-Octane may be flammable in air in the range of 0.96 to 4.66 percent by volume (ref. 9).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-Octane has been reported to be narcotic in high concentrations (ref. 6). Its vapors are mildly irritating to mucous membranes (ref. 9). It also may act as a simple asphyxiant (ref. 5). Isooctane has also been reported to produce narcosis in high concentrations (ref. 5).

Animal toxicity studies indicated that 6,600 to 13,700 ppm n-octane caused narcosis in mice within 30 to 90 min (ref. 9). Respiratory arrest was reported at isooctane concentrations of 16,000 to 32,000 ppm for 3 to 5 min in mice (ref. 4).

Aquatic toxicity for isooctane: TLm 96: 1,000-100 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,400 mg/m^3 (300 ppm) for n-octane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m^3 as a time weighted average. A ceiling of 1,800 mg/m^3 determined by a 15-minute sampling period is recommended (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 $\mu g/m^3$ (75 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ $\mu g/l$

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ $\mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/l$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2,000$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ $\mu g/m^3$

$EPC_{AH1a} = 75/420 = 0.18$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ $\mu g/l$

$EPC_{WH2} = 13.8 \times 350 = 4,830$ $\mu g/l$

$EPC_{LH} = 0.2 \times 4,830 = 1,000$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/l$

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

01A200
OCTANES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (75)		833 (0.18)		15.8+
Water, $\mu g/l$ (ppm Wt)			5.3E6	1.0E4	4,830	5,000	
Land, $\mu g/g$ (ppm Wt)			1.1E6	2.0E3	966	1,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.18)		
Water, $\mu g/l$ (ppm Wt)			4,830	5,000	
Land, $\mu g/g$ (ppm Wt)			966	1,000	

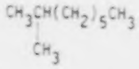
+Reported for urban atmosphere.

CATEGORY: 1A
NONANES: C_9H_{20} 01A220
n-NONANE: A colorless liquid. 01A221
ISONONANE: (2-methyloctane). A liquid. 01A222

WLN:

STRUCTURE:

$CH_3(CH_2)_7CH_3$
n-Nonane


$CH_3\underset{\displaystyle CH_3}{\underset{|}{C}}H(CH_2)_5CH_3$
Isononane

PROPERTIES:

n-nonane: mol. wt: 128.26; mp: -51; bp: 150.798^{760}; d: 0.7176^{20}_{4}; vap. d: 4.41; vap. press: 10 mm at 38.0° C; insoluble in water.
isononane: mol. wt: 128.26; mp: -80.4; bp: 143^{760}; d: 0.713^{20}_{4}.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 0.1 to 0.9 ppbc for n-octane (ref. 1). This is equivalent to 0.006 to 0.52 μg/m³. It has also been reported in samples from finished drinking water (ref. 11).

n-Nonane may be a fire hazard when exposed to heat or flame (ref. 5). It can react with oxidizing materials (ref. 5).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-Nonane is irritating to the respiratory tract and, in high concentration, may produce narcosis (ref. 5).

The acute toxicities of alkanes increase with increasing numbers of carbon atoms; hence, nonanes are believed to be more toxic than octanes (ref. 4). Specific toxicology data on nonane is not presently available.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,040 mg/m³ (200 ppm) for all isomers of nonane.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	1.04×10^6 μg/m³ (200 ppm)	Air, Ecology:
Water, Health:	$15 \times 1.04 \times 10^6 = 1.56 \times 10^7$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 1.56 \times 10^7 = 3.12 \times 10^6$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1{,}040/420 = 2{,}476$ μg/m³

$EPC_{AH1a} = 200/420 = 0.48$ ppm

$EPC_{WH1} = 15 \times 2{,}476 = 3.7 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 1{,}040 = 1.43 \times 10^4$ μg/l

$EPC_{LH} = 0.2 \times 1.43 \times 10^4 = 2{,}900$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01A220
NONANES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.0E6 (200)		2,500 (0.48)		0.006-0.52
Water, μg/l (ppm Wt)			1.6E7		14,300		
Land, μg/g (ppm Wt)			3.1E6		2,900		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			2,500 (0.48)		
Water, μg/l (ppm Wt)			14,300		
Land, μg/g (ppm Wt)			2,900		

CATEGORY: 1A

ALKANES: (C = 10,11) 01A240
n-DECANE: $C_{10}H_{22}$ (decylhydride). A liquid. 01A241
n-UNDECANE: $C_{11}H_{24}$ (hendecane). A colorless liquid. 01A242

WLN:

STRUCTURE:

$CH_3(CH_2)_8CH_3$

n-decane

$CH_3(CH_2)_9CH_3$

n-undecane

PROPERTIES:

n-decane: mol. wt: 142.29; mp: -29.7; bp: 174.1^{760}; d: 0.7300^{20}_{4}; vap. d: 4.90; vap. press: 1 mm at 16.5° C; insoluble in water.
n-undecane: mol. wt: 156.32; mp: -25.59; bp: 195.7^{760}; d: 0.74017^{20}; vap. d: 5.4; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 0.5 to 11 ppbc for n-decane (ref. 1). This is equivalent to 0.29 to 6.39 μg/m³. A level of 0.95 ppb n-undecane is reported in urban atmosphere (ref. 1). This is equivalent to 6.06 μg/m³. Samples taken from finished drinking water supplies have been reported to contain n-decane and n-undecane (ref. 11).

Both n-decane and n-undecane may present a fire hazard when exposed to heat or flame. They can react with oxidizing materials (ref. 5). Also, n-decane may be explosive in air in the range of 0.8 to 5.4 percent by volume (ref. 5).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-Decane may produce narcosis in high concentrations (ref. 5).

Specific toxic properties of alkanes of 10 or 11 carbons is not available. There are indications that the acute toxic properties of alkanes increase with increasing numbers of carbons (ref. 4). Decanes and undecanes may be expected to produce, at lower dosages, effects similar to those of octanes or nonanes.

Toxicity to vegetation: n-Decane has been reported to cause the disruption of membranes resulting in leakage, loss of turgor, and the odor of macerated tissue in the onion. The entry of n-decane into plants at different conditions of humidity or at different times of the day is always rapid (ref. 18).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV for nonanes: 1,040 mg/m³ (200 ppm)

***MINIMUM ACUTE TOXICITY CONCENTRATIONS:**

Air, Health:	1.04×10^6 μg/m³ (<200 ppm)	Air, Ecology:	
Water, Health:	$15 \times 1.04 \times 10^6 = 1.56 \times 10^7$ μg/l	Water, Ecology:	
Land, Health:	$0.2 \times 1.56 \times 10^7 = 3.12 \times 10^6$ μg/g	Land, Ecology:	

***ESTIMATED PERMISSIBLE CONCENTRATIONS:**

$EPC_{AH1} = 10^3 \times 1{,}040/420 = 2{,}500$ μg/m³

$EPC_{WH1} = 15 \times 2{,}500 = 3.75 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 1{,}040 = 1.43 \times 10^4$ μg/l

$EPC_{LH} = 0.2 \times 1.43 \times 10^4 = 2{,}860$ μg/g

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*Based on TLV for nonanes

01A240
ALKANES (C-10,11)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+Based on Health Effects	Based on Ecological Effects	+ Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.0E6		2,500		0.29-6.4
Water, μg/l (ppm Wt)			1.6E7		14,300		
Land, μg/g (ppm Wt)			3.1E6		2,860		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+ A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			2,500		
Water, μg/l (ppm Wt)			14,300		
Land, μg/g (ppm Wt)			2,860		

+Based on data for nonanes.

CATEGORY: 1A

n-DODECANE: $C_{12}H_{26}$ (dihexyl, dodecylene) 01A260
A colorless liquid.

WLN:

STRUCTURE:

$CH_3(CH_2)_{10}CH_3$

n-dodecane

PROPERTIES:

Molecular wt: 170.34; mp: -9.6; bp: 216.3^{760}; d: 0.7487_4^{20}; vap. d: 5.81; vap. press: 1 mm at 47.2° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Urban atmosphere concentration is reported as 1.30 ppb (ref. 1). This is equivalent to 9.04 $\mu g/m^3$. It has been found in samples from public drinking water supplies (ref. 11).

Oxidation of the terminal carbon atom appears to be the predominant reaction of saturated aliphatic hydrocarbon chains in soil and in cultures of microorganisms. The usual isolated product of microbiological oxidation of such alkanes is a carboxylic acid (ref. 17).

TOXIC PROPERTIES, HEALTH EFFECTS:

Little information is available regarding the acute toxic properties of n-dodecane. Properties are probably similar to those of other alkanes of similar chain length. There are indications that acute toxic properties of alkanes increase with increasing numbers of carbons (ref. 4).

It has been demonstrated that there is a 1,000-fold increase in the enhancement of potency of low concentrations of benzo[a]pyrene and benz[a]anthracene when n-dodecane is the diluent. The effect of n-dodecane is most obvious during exposure to low concentrations of carcinogens (ref. 11). No carcinogenic activity is evident with the cocarcinogen n-dodecane alone (refs. 12, 13).

Toxicity to vegetation: n-Dodecane has been reported to reduce the transpiration rate of the mustard plant and may kill the plant (ref. 13).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	1.04×10^6 $\mu g/m^3$ (<200 ppm)	Air, Ecology:
Water, Health:	$15 \times 1.04 \times 10^6 = 1.56 \times 10^7$ $\mu g/l$	Water, Ecology:
Land, Health:	$0.2 \times 1.56 \times 10^7 = 3.12 \times 10^6$ $\mu g/g$	Land, Ecology:

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1{,}040/420 = 2{,}500$ $\mu g/m^3$

$EPC_{WH1} = 15 \times 2{,}500 = 3.75 \times 10^4$ $\mu g/l$

$EPC_{WH2} = 13.8 \times 1{,}040 = 1.43 \times 10^4$ $\mu g/l$

$EPC_{LH} = 0.2 \times 1.43 \times 10^4 = 2{,}900$ $\mu g/g$

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*Based on TLV for nonanes = 1,040 mg/m^3 (200 ppm).

01A260
n-DODECANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	[+] Based on Health Effects	Based on Ecological Effects	[+] Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.0E6		2,500		9.04[++]
Water, μg/l (ppm Wt)			1.6E7		14,300		
Land, μg/g (ppm Wt)			3.1E6		2,860		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	[+] A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			2,500		
Water, μg/l (ppm Wt)			14,300		
Land, μg/g (ppm Wt)			2,860		

[+] Based on data for nonanes.

[++] Reported for urban atmosphere.

REFERENCES: CATEGORY 1A

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REFERENCES: CATEGORY 1A (Continued)

13. Bingham, E. and Falk L., Environmental Carcinogens. The Modifying Effect of Carcinogens on the Threshold Response. Archives Environmental Health - Vol. 19, (1969) pp. 779-783.

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CATEGORY 1

ALIPHATIC HYDROCARBONS

SUBCATEGORY: 1B - Alkenes, Cyclic Alkenes, and Dienes

Summary of Subcategory

Total number of compounds in subcategory	26
number of parent compounds with subspecies	6
number of subspecies	21
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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CATEGORY: 1B

WLN: 1 U1

ETHYLENE: C_2H_4 (ethene) 018020

A colorless, flammable gas with sweet odor and taste.

STRUCTURE:

$H_2C{=}CH_2$

PROPERTIES:

Molecular wt: 28; mp: -169.4; bp: 103.9;
d: 0.610; vap. d.: 0.98; vap. press.: 760 mm at -103.7;
slightly soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural background concentration in air is reported as 2.9 to 41.6 ppb (ref. 1). This is equivalent to 1.7 to 24 $\mu g/m^3$. Ethylene participates to a limited extent in photooxidation reactions (ref. 2).

Ethylene is produced naturally by plants and acts as a plant hormone (ref. 3).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic properties are reported for exposed workers. Toxicity to plants: Exposure to 0.04 ppm for 3-4 hours is reported to cause leaf epinasty in tomato (ref. 4); exposure to 0.001 ppm for 1 day has resulted in leaf epinasty in African marigold (ref. 5). Ethylene "is the only hydrocarbon that should have adverse effects on vegetation at ambient concentrations of 1 ppm or less." (ref. 3). Aquatic toxicity rating: TLm 96: 1,000-100 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Classified by ACGIH as simple asphyxiant.

TLV_{SA} = 5,000 ppm or 5,710 mg/m^3.

On First Priority Chemicals List of the Chemical Industry Institute of Toxicology (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $5.71 \times 10^6\ \mu g/m^3$ (5,000 ppm)
Water, Health: $15 \times 5.7 \times 10^6 = 8.6 \times 10^7\ \mu g/l$
Land, Health:

Air, Ecology: $1.00\ \mu g/m^3$
Water, Ecology: $100 \times 100 = 1.0 \times 10^4 = 10^4\ \mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 5{,}710/420 = 13{,}600\ \mu g/m^3$
$EPC_{AH1a} = 5{,}000/420 = 11.9$ ppm
$EPC_{WH1} = 15 \times 13{,}600 = 2.0 \times 10^5\ \mu g/l$
$EPC_{WH2} = 13.8 \times 5{,}710 = 7.9 \times 10^4\ \mu g/l$

$EPC_{AE} = 0.1 \times 1 = 0.1\ \mu g/m^3$

$EPC_{WE} = 50 \times 100 = 5{,}000\ \mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01B020
ETHYLENE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.7E6 (5,000)	1.0E0	13,600 (12)	0.1	1.7-24
Water, $\mu g/l$ (ppm Wt)			8.6E7	1.0E4	79,000	5,000	
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			13,600 (12)	0.1	
Water, $\mu g/l$ (ppm Wt)			79,000	5,000	
Land, $\mu g/g$ (ppm Wt)					

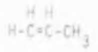
CATEGORY: 1B

PROPYLENE: C_3H_6 (propane). 01B040

A colorless flammable gas.

WLN: 2U1

STRUCTURE:



$$H\text{-}\overset{H}{C}{=}\overset{H}{C}\text{-}CH_3$$

PROPERTIES:

Molecular wt.: 42.1; mp: -185; bp: -47.7;
d: (liquid) 0.581; vap. press.: 10 atm. at 19.8;
vap. d.: 1.5; soluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural background levels in air are reported as 0.6 to 2.9 ppbc (ref. 1). This is equivalent to 0.34 to 1.7 μg/m^3. Propylene participates substantially in photooxidation reactions (ref. 2).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic properties are reported for exposed workers.

Toxicity to plants: Exposure to 50 ppm for 48 hours produces epinasty in tomato petiole; 72 hour exposure to 1,000 ppm causes declination in sweet pea seedlings (ref. 2). 50 ppm is equivalent to 86,000 μg/m^3.

Below are listed the relative concentrations of hydrocarbons, including propylene, that produce adverse plant responses similar to that produced by ethylene (ref. 22).

COMPOUND	INHIBITION OF GROWTH	
	Pea Stem	Tobacco
ethylene	1	1
propylene	100	100
acetylene	2,800	100
1-butene	270,000	2,000
1,3-butadiene	5,000,000	-

Aquatic toxicity rating: TLm 96: over 1,000 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Classified by ACGIH as simple asphyxiant.

TLV_{SA} = 5,000 ppm. This is equivalent to 8,600 mg/m^3.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 8.6×10^6 μg/m^3 (5,000 ppm)
Water, Health: $15 \times 8.6 \times 10^5 = 1.3 \times 10^7$ μg/l
Land, Health:

Air, Ecology: $86{,}000 \times 48/24 = 1.7 \times 10^5$ μg/m^3
Water, Ecology: $100 \times >1{,}000 = 10^5$ μg/l
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 8{,}600/420 = 20{,}000$ μg/m
$EPC_{AH1a} = 5{,}000/420 = 11.9$ ppm
$EPC_{WH1} = 15 \times 20{,}000 = 3 \times 10^5$ μg/l
$EPC_{WH2} = 13.8 \times 8{,}600 = 1.2 \times 10^5$ μg/l

$EPC_{AE} = 0.1 \times 86{,}000 \times 2 = 1.7 \times 10^4$ μg/m^3
$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$

MULTIMEDIA ENVIRONMENTAL GOALS

01B040
PROPYLENE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			8.6E6 (5,000)	1.7E5	20,000 (12)	17,000	0.34-1.7
Water, $\mu g/l$ (ppm Wt)			1.3E7	1.0E5	120,000	50,000	
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			20,000 (12)	17,000	
Water, $\mu g/l$ (ppm Wt)			120,000	50,000	
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 1B

WLN:

BUTYLENES: C_4H_8 01B060

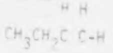
1-BUTENE: (α-butylene, ethylethylene). A colorless, flammable gas; slightly aromatic odor. 01B061

cis-2-BUTENE: (cis-β-butylene, dimethylethylene, pseudo-butylene). A colorless, flammable gas with slightly aromatic odor. 01B062

trans-2-BUTENE: (trans-β-butylene). A colorless, flammable gas, with slightly aromatic odor. 01B063

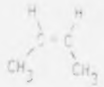
ISOBUTYLENE: (2-methylpropene, isobutene). A gas. 01B064

STRUCTURE:

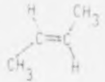


$CH_3CH_2\overset{H}{C}\;\overset{H}{C}\text{-}H$

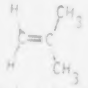
1-butene



cis-2-butene



trans-2-butene



isobutylene

PROPERTIES:

	mol. wt.	bp	mp	d	sol. in water	vap. press	vap. d
1-butene:	56.12	-6.3	-185.4	0.595	insoluble	3,480 mm at 21°	1.93
cis-2-butene:	56.12	3.7	-138.9	0.621	insoluble	1,410 mm at 21°	1.9
trans-2-butene:	56.12	0.9	-105.6	0.604		1,592 mm at 21°	1.9
isobutylene:	56.12	-6.9	-140.4	0.594	insoluble	3,290 mm at 40.5°	1.94

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Butylenes are present in coal gas (ref. 8).

Concentration in rural atmosphere is reported as 1 ppb for 1-butene, 0.4 to 0.6 ppbc for cis-2-butene, 0.3 to 1.1 ppbc for trans-2-butene, and 0.3 to 1.1 ppbc for isobutylene (ref. 1). These values are equivalent to 2.29 µg/m³ and 0.23 to 0.34 µg/m³ for 1-butene and cis-2-butene respectively, and 0.17 to 0.63 µg/m³ for both trans-2-butene and isobutylene.

1-Butene has been reported in samples taken from public drinking water in Grand Forks, N.D. (ref. 9). It has also been found in seawater (ref. 10).

1-Butene can be formed by thermal decomposition of butane, pentane, or isopentane (ref. 8). Isobutylene can be formed by absorption on H_2SO_4 at about 15° C (ref. 8).

Isobutylene is used to produce polymers, antioxidants for foods, packaging, food supplements, and for plastics (ref. 8). Formaldehyde and dimethylketone are major products of photochemical oxidation of isobutylene in the presence of nitric oxide (ref. 11).

1-Butene may explode when mixed with oxygen or flame (refs. 12, 8). Flammable limits for 1-Butene are from 1.98 to 9.65 percent by volume in air (ref. 13).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

Butylenes are considered simple asphyxiants and, in high concentrations, may produce narcosis. The butylene isomers are similar in their pharmacological activity as weak anesthetics. They are about 4.5 times as toxic as ethylene (ref. 13). They are not considered dangerous to the health of workmen exposed to low concentrations for prolonged periods of time or to higher concentrations for relatively short periods of time (ref. 13).

Effects on vegetation: Exposure to 1.14 x 10⁸ µg/m³ (50,000 ppm) for 2 days produced epinasty in tomato petiole (ref. 2). No adverse effects on plants were observed at 1,000 ppm (ref. 22).

Below are listed the relative concentrations of hydrocarbons, including 1-butyene, that produce adverse plant responses similar to that produced by ethylene (ref. 22).

COMPOUND	INHIBITION OF GROWTH	
	Pea Stem	Tobacco
ethylene	1	1
propylene	100	100
acetylene	2,800	100
1-butene	270,000	2,000
1,3-butadiene	5,000,000	-

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV_{SA} = 5,000 ppm or 1.15 x 10^4 mg/m^3

A flammable range of 1-butene of 1.98 to 9.65 percent by volume in air places a maximum permissible concentration for workroom atmospheres at 9.14 x 10⁶ µg/m³ (4,000 ppm) on the basis of flammability (ref. 13).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 9.14 x 10^6 µg/m^3 (4,000 ppm)

Water, Health: 15 x 9.14 x 10^6 = 1.4 x 10^8 µg/l

Land, Health:

Air, Ecology: 2.3 x 10^7 µg/m^3 (10,000 ppm)

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH1} = 10^3 x 9.14 x 10^3/420 = 2.2 x 10^4 µg/m^3

EPC_{AH1a} = 4,000/420 = 9.5 ppm

EPC_{WH1} = 15 x 2.2 x 10^4 = 3.3 x 10^5 µg/l

EPC_{WH2} = 13.8 x 9.14 x 10^3 = 1.26 x 10^5 µg/l

EPC_{AE} = 2.3 x 10^5 µg/m^3 (1,000 ppm)

MULTIMEDIA ENVIRONMENTAL GOALS

01B060
BUTYLENES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			9.1E6 (4,000)	2.3E7 (1x10^4)	22,000 (9.5)	2.3x10^6 (1,000)	0.17-0.29
Water, μg/l (ppm Wt)			1.4E8		126,000		
Land, μg/g (ppm Wt)							

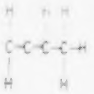
*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			22,000 (9.5)	2.3 x 10^6 (1,000)	
Water, μg/l (ppm Wt)			126,000		
Land, μg/g (ppm Wt)					

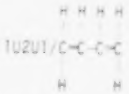
CATEGORY: 1B
BUTADIENES: C_4H_6 01B080
1,2-BUTADIENE: (methylallene). A liquid or gas. 01B081
1,3-BUTADIENE: (bivinyl, divinyl, erythrene, buta-1,3-diene). A colorless, flammable gas, mild aromatic odor. 01B082

WLN:

STRUCTURE:



1,2-butadiene



1,3-butadiene

PROPERTIES:
1,2-butadiene: mol.wt: 54.09; mp: -136.19; bp: 10.85^{760}; d: 0.652^{20}_{4}; insoluble in water.
1,3-butadiene: mol. wt: 54.09; mp: -108.91; bp: -4.41^{760}; d: 0.6211^{20}_{4}; vap. press: 1,840 mm at 21° C; vap. d: 1.87; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Petroleum gas is a source of 1,3-butadiene (ref. 8). It occurs in gasoline vapors and in cigarette smoke (ref. 14).

Concentration in rural atmosphere is reported as <0.1 ppbc (ref. 1). This is equivalent to a concentration of <0.06 $\mu g/m^3$. Urban concentrations vary with the time of day and are generally below 10 ppb (ref. 14).

1,3-Butadiene is used as a polymer component in manufacturing synthetic rubbers, and in the Diels-Alder condensation for the synthesis of many diverse compounds (ref. 8).

1,3-Butadiene is formed by dehydrogenation of butene or butene-butane mixtures, along with several other methods (ref. 8).

1,3-Butadiene can be detected with an iodine-pentoxide method (ref. 13).

1,3-Butadiene may explode when exposed to heat or flame. Conjugated dienes form organic peroxides on standing that are explosive when concentrated and heated (ref. 12).

Butadienes participate appreciably in photoxidation reactions (ref. 14).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

Effects of 1,3-butadiene include irritation to skin and mucous membranes (refs. 12, 8). Inhalation of 250,000 ppm has resulted in human death (ref. 6). If 1,3-butadiene is in contact with skin it may cause burns or frostbite due to rapid vaporization (ref. 12). The major effect is narcosis produced only at high concentrations (ref. 15).

Human toxicity studies have shown that breathing 8,000 ppm for 8 hours causes irritation of the eyes and upper respiratory tract (ref. 15).

LC_{Lo} (inhalation, rabbit): 250,000 ppm (ref. 8).

Animal studies indicate chronic effects are not significant.

Aquatic toxicity for 1,3-butadiene: TLm 96: 100-10 ppm (ref. 6).

Effects on vegetation: Studies indicate that butadiene itself at concentrations up to 2.2×10^6 $\mu g/m^3$ (1,000 ppm) has little effect on plants. Its photooxidation products may cause damage, however, (ref. 14).

Below are listed the relative concentrations of hydrocarbons, including 1,3-butadiene, that produce adverse plant responses similar to that produced by ethylene (ref. 22).

COMPOUND	INHIBITION OF GROWTH	
	Pea Stem	Tobacco
ethylene	1	1
propylene	100	100
acetylene	2,800	100
1-butene	270,000	2,000
1,3-butadiene	5,000,000	-

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV for 1,3-butadiene = 2,200 mg/m^3 (1,000 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.20×10^6 $\mu g/m^3$ (1,000 ppm)
Water, Health: $15 \times 2.2 \times 10^6 = 3.3 \times 10^7$ $\mu g/l$
Land, Health:

Air, Ecology: 2.20×10^6 $\mu g/m^3$
Water, Ecology: $100 \times 10 = 1,000$ $\mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2,200/420 = 5,238$ $\mu g/m^3$
$EPC_{AH1a} = 1,000/420 = 2.38$ ppm
$EPC_{WH1} = 15 \times 5,238 = 7.86 \times 10^4$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 2,200 = 3.04 \times 10^4$ $\mu g/l$

$EPC_{AE} = 0.1 \times 2.20 \times 10^6 = 2.20 \times 10^5$ $\mu g/m^3$
$EPC_{WE1} = 50 \times 10 = 500$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01B080
BUTADIENES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			2.2E6 (1,000)	2.2E6	5,240 (2.4)	220,000	0.06
Water, μg/l (ppm Wt)			3.3E7	1.0E3	30,400	500	
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			5,240 (2.4)	220,000	
Water, μg/l (ppm Wt)			30,400	500	
Land, μg/g (ppm Wt)					

CATEGORY: 18

PENTENES: C_5H_{10} (amylenes) 018100

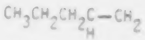
1-PENTENE: (1-pentylene, propylethylene, methyl butene, α-n-amylene). A liquid, highly disagreeable odor. 018101

cis-2-PENTENE: (cis-β-n-amylene). A liquid. 018102

trans-2-PENTENE: (trans-β-n-amylene). A liquid. 018103

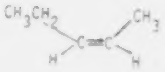
WLN:

STRUCTURE:

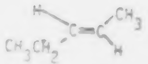


$CH_3CH_2CH_2\underset{H}{C}-CH_2$

1-pentene



cis-2-pentene



trans-2-pentene

PROPERTIES:

	Mol. wt.	mp	bp	d	solubility in water	vap. d
1-pentene:	70.14	-138	29.9	0.641	insoluble	2.42
cis-2-pentene:	70.14	-151.4	36.9	0.656	insoluble	2.41
trans-2-pentene:	70.14	-136	36.4	0.648	insoluble	2.41

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Pentenes are present in coal tar (ref. 8).

Concentrations in rural atmosphere are reported as: 0.2 to 0.6 ppbc for 1-pentene, and <0.1 ppbc for cis- and trans-2-pentene (ref. 1). This is equivalent to 0.11 to 0.34 μg/m³ for 1-pentene, and <0.06 μg/m³ for cis- and trans-2-pentene. Samples from public drinking water supplies have been reported to contain 1-pentene (ref. 10).

Cis-2-pentene can be used as a surgical anesthesia (ref. 13).

A mixture of cis- and trans-isomers is formed by dehydration of 2-pentanol (ref. 8).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Pentene is a simple asphyxiant, and in high concentrations may produce narcosis. 2-Pentene is believed to produce narcosis in high concentrations (ref. 12).

Toxicity of pentenes is probably similar to that of alkanes, especially the pentanes.

Toxicity to vegetation: 1-pentene in air can react with ozone to form ozonated pentene which may kill recently matured leaves of the pinto bean (ref. 23). Ozonated 2-pentene is reported to have caused a grey coloration to the pinto bean plant exposed to 143 mg/m³ (50 ppm) for 35 min (ref. 24).

Ozone-olefin mixtures such as ozonated-2-pentene, -1-pentene, -3-heptene, and -1-hexene produce injury to the lower leaf surface of plants, resulting in the closing of stomata, increased respiration, and inhibition of growth. However, half-life of these ozone-olefin mixtures are reported to be only approximately 0.5 hr (ref. 25).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV_{SA} = 5,000 ppm or 1.44×10^4 mg/m³.

TLV = 1,800 mg/m³ (600 ppm) for n-pentane.

$C_5 - C_8$ alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes $C_5 - C_8$ is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 16).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 μg/m³ (120 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ μg/l

Land, Health: $0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ μg/g

Air, Ecology: $143 \times 10^3 \times 35/1440 = 3.48 \times 10^3$ μg/m³

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ μg/m³

$EPC_{AH1a} = 120/420 = 0.3$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ μg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 966$ μg/g

$EPC_{AE} = 0.1 \times 3.48 \times 10^3 = 348$ μg/m³

+Based on data for C_5-alkanes.

MULTIMEDIA ENVIRONMENTAL GOALS

01B100
PENTENES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+ Based on Health Effects	Based on Ecological Effects	+Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (120)	3.5E3	833 (0.3)	348	<0.06-0.34
Water, $\mu g/l$ (ppm Wt)			5.3E6		4,830		
Land, $\mu g/g$ (ppm Wt)			1.1E6		966		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+ A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.3)	348	
Water, $\mu g/l$ (ppm Wt)			4,830		
Land, $\mu g/g$ (ppm Wt)			966		

+Based on data for C_5-alkanes.

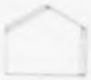
CATEGORY: 18

CYCLOPENTADIENE: C_5H_6 (1,3-cyclopentadiene) 018120

A colorless liquid, with terpine-like odor

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 66.10; mp: -97.2; bp: 40.0^{760}; d: 0.8021^{20}_{4}, insoluble in water

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cyclopentadiene occurs in coal (ref. 8).

Cyclopentadiene has been found in samples taken from finished drinking water supplies (ref. 10).

An insecticide and fungicide (ref. 12), cyclopentadiene is also used in manufacturing resins, and in organic synthesis as the diene in the Diels-Alder reaction producing sesquiterpenes, synthetic alkaloids, and camphors (ref. 8).

Cyclopentadiene is produced from the distillates produced in carbonization of coal. Cyclopentadiene polymerizes to dicyclopentadiene on standing (ref. 8).

At high temperatures and pressures cyclopentadiene decomposes violently (ref. 12).

TOXIC PROPERTIES, HEALTH EFFECTS:

Human sensory response was unfavorable at concentrations of 500 ppm and 250 ppm (ref. 15).

Rats exposed to 500 ppm for 35 days, 7 hours per day, during a study period of 53 days showed liver and kidney damage. At 250 ppm, rats, rabbits, guinea pigs, and dogs showed no adverse effects after 135 exposures (ref. 15).

LD_{50} of dicyclopentadiene (oral, rat): 353 mg/kg (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 200 mg/m^3 (75 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	2.0×10^5 µg/m^3 (75 ppm)	Air, Ecology:
Water, Health:	$15 \times 2.0 \times 10^5 = 3.0 \times 10^6$ µg/l	Water, Ecology:
Land, Health:	$0.2 \times 3.0 \times 10^6 = 6.0 \times 10^5$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 200/420 = 476$ µg/m^3

$EPC_{AH1a} = 75/420 = 0.18$ ppm

$EPC_{WH1} = 15 \times 476 = 7,140$ µg/l

$EPC_{WH2} = 13.8 \times 200 = 2,760$ µg/l

$EPC_{LH} = 0.2 \times 2,760 = 552$ µg/g

01B120
CYCLOPENTADIENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.0E5 (75)		476 (0.18)		
Water, $\mu g/l$ (ppm Wt)			3.0E6		2,760		
Land, $\mu g/g$ (ppm Wt)			6.0E5		552		

*To be multiplied by dilution factor

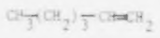
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			476 (0.18)		
Water, $\mu g/l$ (ppm Wt)			2,760		
Land, $\mu g/g$ (ppm Wt)			552		

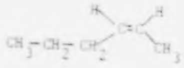
CATEGORY: 1B

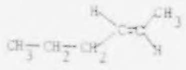
HEXENES: C_6H_{12} 01B140

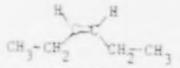
1-HEXENE: (hexene, butylethylene, hexylene). A colorless liquid. 01B141
cis-2-HEXENE: A liquid. 01B142
trans-2-HEXENE: A liquid. 01B143
cis-3-HEXENE: A liquid. 01B144
trans-3-HEXENE: A liquid. 01B145

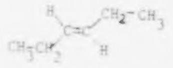
WLN/STRUCTURE:


1-hexene


cis-2-hexene


trans-2-hexene


cis-3-hexene


trans-3-hexene

PROPERTIES:	mol. wt.	mp	bp	d	solubility in water	vap. press	vap. d
1-hexene:	84.16	-139.8	63.4	0.673	insoluble	310 mm at 38°	3.0
cis-2-hexene:	84.16	-141.4	68.8	0.687	insoluble		2.92
trans-2-hexene:	84.16	-133	68	0.678	insoluble		2.92
cis-3-hexene:	84.16	-137.8	66.4	0.680	insoluble		
trans-3-hexene:	84.16	-113.4	67.1	0.677	insoluble		

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere for 1-hexene is reported as 0.5 ppbc (ref. 1). This is equivalent to 0.29 μg/m³.

1-Hexene may present a fire hazard when exposed to heat or flame (ref. 12).

Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

Limited animal experiments with 2-hexene suggest a low toxicity (ref. 12).

Toxic properties are likely to be similar to those of alkanes, especially hexanes.

Aquatic toxicity: TLM 96: >1,000 ppm for n-hexane and isohexane (ref. 6).

Toxicity to vegetation: The reaction of cis-3-hexene at 34 mg/m³ (10 ppm) with 1.18 mg/m³ (0.6 ppm) ozone resulted in discoloration of the pinto bean plant after 35 min (ref. 24).

Ozone-olefin mixtures such as ozonated-2-pentene, -1-pentene, -3-heptene, and -1-hexene produce injury to the lower leaf surface of plants, resulting in the closing of stomata, increased respiration, and inhibition of growth. However, half-life of these ozone-olefin mixtures are reported to be only approximately 0.5 hr (ref. 25).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 350 mg/m³ (100 ppm) for n-hexane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 16).

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 μg/m³ (100 ppm
Water, Health: $15 \times 3.5 \times 10^5 = 5.25 \times 10^6$ μg/l
Land, Health: $0.2 \times 5.25 \times 10^6 = 1.1 \times 10^6$ μg/g

Air, Ecology: $34 \times 10^3 \times 35/1440 = 826$ μg/m³
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

* ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ μg/m³
$EPC_{AH1a} = 100/420 = 0.24$ ppm
$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ μg/l
$EPC_{WH2} = 13.8 \times 350 = 4,830$ μg/l
$EPC_{LH} = 0.2 \times 4,830 = 966$ μg/g

$EPC_{AE} = 0.1 \times 34 \times 10^3 \times 35/1440 = 82.6$ μg/m³
$EPC_{WE1} = 50 \times >1,000 = >5 \times 10^4$ μg/l
$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ μg/g

*Values based on TLV and ecological data for n-hexane.

01B140
HEXENES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	+ A. Minimum Acute Toxicity Effluent		+B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.5E5 (100)	8.3E2	833 (0.24)	82.6	0.29
Water, μg/l (ppm Wt)			5.3E6	1.0E5	4,830	50,000	
Land, μg/g (ppm Wt)			1.1E6	2.0E4	970	10,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		+ II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			833 (0.24)	82.6	
Water, μg/l (ppm Wt)			4,830	50,000	
Land, μg/g (ppm Wt)			970	10,000	

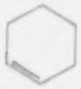
+Based on data for C_6-alkanes.

CATEGORY: 1B

CYCLOHEXENE: C_6H_{10} (3,4,5,6-tetrahydrobenzene, benzenetetrahydride, hexanaphthylene, tetrahydrobenzene). A colorless liquid. 01B160

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 82.15; mp: -103.5° C; bp: 82.98^{760}; d: 0.8102^{20}_{4}; vap.d: 2.8; vap. press: 160 mm at 38° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cyclohexene occurs in coal tars (ref. 12).

Cyclohexene has been detected in samples taken from finished drinking water supplies (ref. 10).

Formation may occur by dehydration of cyclohexanol at high temperatures with catalysts (ref. 8).

Cyclohexene has been used as an alkylation component. It has been used in manufacturing adipic acid, maleic acid, hexahydrobenzoic acid, and aldehyde. It has been suggested for use as a stabilizer for high octane gasoline (ref. 8).

Cyclohexene may react with oxidizing materials; it may present a fire hazard when exposed to flame (ref. 12).

TOXIC PROPERTIES, HEALTH EFFECTS:

Cyclohexene is reported to be somewhat more toxic to animals than cyclohexane.

Toxicity to vegetation: With respect to barley and carrot plants, toxicity increases from lowest to highest among the hydrocarbons: hexane→hexene→cyclohexane→cyclohexene→benzene (ref. 26).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,015 mg/m^3 (300 ppm).

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m^3 as a time weighted average. A ceiling of 1,800 mg/m^3 determined by a 15-minute sampling period is recommended (ref. 16).

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	3.5×10^5 µg/m^3 (120 ppm)	Air, Ecology:
Water, Health:	$15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ µg/l	Water, Ecology:
Land, Health:	$0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ µg/g	Land, Ecology:

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ µg/m^3

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ µg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 966$ µg/g

*Based on NIOSH recommendation for C_5-C_8 alkanes.

MULTIMEDIA ENVIRONMENTAL GOALS

01B160
CYCLOHEXENE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+ Based on Health Effects	Based on Ecological Effects	+ Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (100)		833 (0.24)		
Water, $\mu g/l$ (ppm Wt)			5.3E6		4,830		
Land, $\mu g/g$ (ppm Wt)			1.1E6		1,000		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+ A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.24)		
Water, $\mu g/l$ (ppm Wt)			4,830		
Land, $\mu g/g$ (ppm Wt)			1,000		

+Based on data for C_6-alkanes.

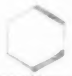
CATEGORY: 1B

CYCLOHEXADIENES: C_6H_8 01B180

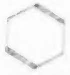
1,3-CYCLOHEXADIENE: (1,2-dihydrobenzene). A liquid. 01B181
1,4-CYCLOHEXADIENE: (1,4-dihydrobenzene). A liquid. 01B182

WLN:

STRUCTURE:



1.3-cyclohexadiene



1,4-cyclohexadiene

PROPERTIES:

1,3-cyclohexadiene: mol. wt: 80.14; mp: -89; bp: 80.5^{760}; d: 0.8405^{20}_{4}; insoluble in water.
1,4-cyclohexadiene: mol. wt: 80.14; mp: -49.2; bp: 85.6^{760}; d: 0.8471^{20}_{4}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,4-Cyclohexadiene is formed in the combustion of polyvinylchloride (ref. 17). 1,3-and 1,4-Cyclohexadiene is photooxidized to hexatriene by ultraviolet light (ref. 18).

TOXIC PROPERTIES, HEALTH EFFECTS:

No information is available regarding the toxic properties of cyclohexadiene in humans or in experimental animals. Its properties are likely to be similar to those of hexane.

1,3-Cyclohexadiene has been reported to be toxic to young coho-salmon (ref. 19).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m^3 as a time weighted average. A ceiling of 1,800 mg/m^3 determined by a 15-minute sampling period is recommended (ref. 16).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	3.5×10^5 µg/m^3 (120 ppm)	Air, Ecology:
Water, Health:	$15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ µg/l	Water, Ecology:
Land, Health:	$0.2 \times 5.3 \times 10^6 = 1.1 \times 10^6$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ µg/m^3

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ µg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000$ µg/g

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*Based on NIOSH recommendation for C_5-C_8 alkanes.

MULTIMEDIA ENVIRONMENTAL GOALS

01B180
CYCLOHEXADIENES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+Based on Health Effects	+Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.5E5 (100)		833 (0.24)		
Water, $\mu g/l$ (ppm Wt)			5.3E6		4,830		
Land, $\mu g/g$ (ppm Wt)			1.1E6		1,000		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			833 (0.24)		
Water, $\mu g/l$ (ppm Wt)			4,830		
Land, $\mu g/g$ (ppm Wt)			1,000		

+Based on data for C_6 - Alkanes

CATEGORY: 18

HEPTENES: C_7H_{14} 018200

1-HEPTENE: (α-heptylene). A colorless liquid. 018201
cis-2-HEPTENE: (β-heptylene). A clear liquid. 018202
trans-2-HEPTENE: A clear liquid. 018203
cis-3-HEPTENE: (4-heptene, [illegible]-heptylene). A liquid. 018204
trans-3-HEPTENE: (4-heptene, [illegible]-heptylene). A liquid. 018205

PROPERTIES:

	mol. wt	mp	bp	d	solubility in water	vap. d
1-heptene:	98.19	-119	93.6	0.697	insoluble	
cis-2-heptene:	98.19		98.5	0.708	insoluble	
trans-2-heptene:	98.19	-109.5	98	0.701	insoluble	
cis-3-heptene:	98.19		95.8	0.703	insoluble	3.38
trans-3-heptene:	9d.19	-136.6	95.7	0.698	insoluble	3.38

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Both 2-heptene and 3-heptene may present a fire hazard when exposed to heat or flame. 3-Heptene can react vigorously with oxidizing materials (ref. 12)

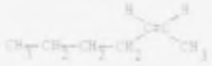
Unsaturated aliphatic hydrocarbons are attacked by soil microorganisms in a variety of ways. A molecule may be oxidized at a terminal methyl or methylene group, it may be oxidized at the double bond, double bonds may be reduced. However, oxidative attack at the terminal methyl group appears to be the major degradation pathway for unsaturated aliphatic hydrocarbons (ref. 21).

WLN:

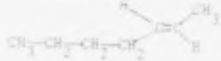
STRUCTURE:

$CH_3(CH_2)_4CH=CH_2$

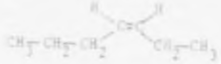
1-heptene



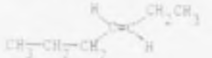
cis-2-heptene



trans-2-heptene



cis-3-heptene



trans-3-heptene

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Heptene is referred to as a simple asphyxiant. 2-Heptene and 3-heptene are believed to be irritating and narcotic in high concentrations (ref. 12).

Toxic properties are likely to be similar to those of heptanes.

Aquatic toxicity: TLm 96 for 1-heptene: over 1,000 ppm for 1-heptene,
2-heptene, 3-heptene, and 4-heptene (ref. 6).

Toxicity to vegetation: 3-heptene in air will react with ozone to form ozonated heptene which can kill recently matured leaves of the pinto bean (ref. 23).

Ozone-olefin mixtures such as ozonated-2-pentene, -1-pentene, -3-heptene, and -1-hexene produce injury to the lower leaf surface of plants, resulting in the closing of stomata, increased respiration, and inhibition of growth. However, half-life of these ozone-olefin mixtures is reported to be only approximately 0.5 hr (ref. 25).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,600 mg/m³ (400 ppm) for n-heptane.

C_5 - C_8 alkanes are the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to alkanes C_5 - C_8 is 350 mg/m³ as a time weighted average. A ceiling of 1,800 mg/m³ determined by a 15-minute sampling period is recommended (ref. 16).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	3.5×10^5 µg/m³ (85 ppm)	Air, Ecology:	
Water, Health:	$15 \times 3.5 \times 10^5 = 5.3 \times 10^6$ µg/l	Water, Ecology:	$100 \times >1{,}000 = >1.0 \times 10^5$ µg/l
Land, Health:	$0.2 \times 3.5 \times 10^6 = 1.1 \times 10^6$ µg/g	Land, Ecology:	$0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ µg/m³

$EPC_{AH1a} = 85/420 = 0.2$ ppm

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ µg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 1{,}000$ µg/g

$EPC_{WE1} = 50 \times >1{,}000 = >5.0 \times 10^4$ µg/l

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01B200
HEPTENES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	*B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+Based on Health Effects	Based on Ecological Effects	+Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.5E5 (85)		833 (0.2)		
Water, μg/l (ppm Wt)			5.3E6	1.0E5	4,830	50,000	
Land, μg/g (ppm Wt)			1.1E6	2.0E4	1,000	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+ A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			833 (0.2)		
Water, μg/l (ppm Wt)			4,830	50,000	
Land, μg/g (ppm Wt)			1,000	10,000	

+Based on data for C_7-alkanes.

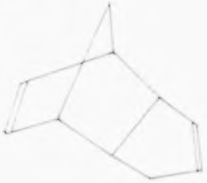
CATEGORY: 18

DICYCLOPENTADIENE: $C_{10}H_{12}$ (bicyclopentadiene,

biscyclopentadiene , 1,3-cyclopentadiene dimer, 3a,7,7,7a-tetrahydro-4,7-methanoindene). 018220. Colorless crystals, with odor similar to terpines.

WLN: L C555 A DU IUTJ

STRUCTURE:



PROPERTIES:

Molecular wt: 132.21; mp: 32.9; bp: 170; d: 0.976^{35}; vap.d: 4.55; vap.press: 10 mm at 47.6°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Dicyclopentadiene is formed from the spontaneous dimerization of cyclopentadiene, a starting material in the chemical synthesis industry. It is also a byproduct of the coke-oven industry (ref. 20).

Dicyclopentadiene can be detected in air using general procedures used for hydrocarbons and olefins (ref. 20).

Dicyclopentadiene has been reported in samples taken from finished drinking water (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

Oral administration of dicyclopentadiene to rats resulted in effects typical of irritating hydrocarbons, that is, tissue hemorraging in the kidney, intestines, stomach, bladder, and lungs (ref. 20).

Dicyclopentadiene is absorbed by inhalation and partly eliminated unchanged in the lung and in the urine. It is believed that the fraction absorbed in the blood would likely be metabolized and excreted in the urine (ref. 20).

LD_{50} (oral, rat): 353 mg/kg (ref. 6).

LC_{LO} (rat): 500 ppm/4 hours (ref. 6).

Aquatic toxicity: TLm 96: 10-1 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 30 mg/m^3 (5 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 30 = 3.0 \times 10^4$ μg/m^3 (5 ppm)

Water, Health: $15 \times 3.0 \times 10^4 = 4.5 \times 10^5$ μg/l

Land, Health: $0.2 \times 4.5 \times 10^5 = 9.0 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 1 = 100$ μg/l

Land, Ecology: $0.2 \times 100 = 20$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 30/420 = 71.4$ μg/m^3

$EPC_{AH1a} = 5/420 = 0.012$ ppm

$EPC_{WH1} = 15 \times 71.4 = 1{,}071$ μg/l

$EPC_{WH2} = 13.8 \times 30 = 414$ μg/l

$EPC_{LH} = 0.2 \times 414 = 83$ μg/g

$EPC_{WE1} = 50 \times 1 = 50$ μg/l

$EPC_{LE} = 0.2 \times 50 = 10$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

01B220
DICYCLOPENTADIENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.0E4 (5)		71.4 (0.012)		
Water, μg/l (ppm Wt)			4.5E5	1.0E2	414	50	
Land, μg/g (ppm Wt)			9.0E4	2.0E1	83	10	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			71.4 (0.012)		
Water, μg/l (ppm Wt)			414	50	
Land, μg/g (ppm Wt)			83	10	

REFERENCES: CATEGORY 1B

Aliphatic Hydrocarbons - Alkenes, Cyclic Alkenes, and Dienes

1. Wagoner, D. Compilation of Ambient Trace Substances. Draft of Report Prepared by Research Triangle Institute under Contract No. 68-02-1325 for U.S. Environmental Protection Agency. Available from Tucker, W. G., Project Officer, IERL-EPA, Research Triangle Park, NC (1976).
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CATEGORY 1

ALIPHATIC HYDROCARBONS

SUBCATEGORY: 1C - Alkynes

Summary of Subcategory

Total number of compounds in subcategory	4
number of parent compounds with subspecies	1
number of subspecies	2
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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CATEGORY: 1C

WLN:

STRUCTURE:

$HC \equiv CH$

ACETYLENE: C_2H_2 (ethyne, ethine), [illegible]

A colorless, flammable gas with garlic odor (odor due to impurities)

PROPERTIES:

Molecular wt: 26.04; mp: -81.8; bp: -84.0; d: 0.6181_4^{-32};
vap. press.: 40 atm at 16.8°C; vap. d: 0.91; slightly soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural concentration in air is reported as 3.9 to 11.4 ppbc (ref. 1). This is equivalent to 0.48 to 6.0 µg/m³. Acetylene participates to a very limited extent in photooxidation reactions (ref. 2).

Acetylene is highly flammable. Flammable limits (by volume) are 2.5-81% in air (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

No significant physiologic properties are reported for exposed workers.
Toxicity to plants—exposure to 50 ppm for 48 hours causes epinasty in tomato petiole; exposure to 250 ppm for 72 hours causes declination in sweet pea seedlings (ref. 3).
50 ppm is equivalent to 53 mg/m³.

Below are listed the relative concentrations of hydrocarbons, including acetylene, that produce adverse plant responses similar to that produced by ethylene (ref. 6).

COMPOUND	INHIBITION OF GROWTH	
	Pea Stem	Tobacco
ethylene	1	1
propylene	100	100
acetylene	2,800	100
1-butene	270,000	2,000
1,3-butadiene	5,000,000	-

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Acetylene is classified by ACGIH as a simple asphyxiant.
TLV_{SA} = 5,000 ppm or 5,300 mg/m³.
Acetylene is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to acetylene is: No exposure in excess of 2,662 mg/m³ (2,500 ppm). This concentration represents 10 percent of the lower explosive limit (ref. 3).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.7×10^6 µg/m³ (2,500 ppm)
Water, Health: $15 \times 2.7 \times 10^6 = 4.1 \times 10^7$ µg/l
Land, Health:

Air, Ecology: $53{,}000 \times 2 = 1.06 \times 10^5$ µg/m³ (100 ppm)
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2{,}662/420 = 6{,}340$ µg/m³
$EPC_{AH1a} = 2{,}500/420 = 6$ ppm
$EPC_{WH1} = 15 \times 6{,}340 = 9.5 \times 10^4$ µg/l
$EPC_{WH2} = 13.8 \times 2{,}662 = 3.7 \times 10^4$ µg/l

$EPC_{AE} = 0.1 \times 53{,}000 \times 2 = 10{,}600$ µg/m³ (10 ppm)

MULTIMEDIA ENVIRONMENTAL GOALS

01C020 ACETYLENE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.7E6 (2,500)	1.1E5 (100)	6,340 (6)	10,600 (10)	
Water, $\mu g/l$ (ppm Wt)			4.1E7		37,000		
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			6,340 (6)	10,600 (10)	
Water, $\mu g/l$ (ppm Wt)			37,000		
Land, $\mu g/g$ (ppm Wt)					

MULTIMEDIA ENVIRONMENTAL GOALS

04A050
EPICHLORHYDRIN

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.0E3 (0.5)		5		
Water, μg/l (ppm Wt)			3.0E4	1.0E3	28	500	
Land, μg/g (ppm Wt)			6.0E3	2.0E2	6	100	

*To be multiplied by dilution factor

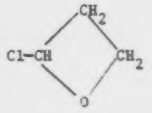
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			5		39
Water, μg/l (ppm Wt)			28	500	581
Land, μg/g (ppm Wt)			6	100	116

CATEGORY: 4A

1-CHLORO-1,3-EPOXYPROPANE: C_3H_5ClO.
(1-chloro-1,2-oxetane). 04A060

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 92.5

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Chloro-1,3-epoxypropane has been demonstrated to be bactericidal to Staphlococcus aureus at low concentrations (ref. 8). Toxicological data for 1-chloro-1,3-epoxypropane are not available at this time. Toxic properties may be expected to be similar to those of 1-chloro-2,3-epoxypropane (epichlorhydrin).

LD_{50} (oral, rat): 90 mg/kg for epichlorhydrin.

Aquatic toxicity: TLm 96: 100-10 ppm for epichlorhydrin (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 20 mg/m^3 (5 ppm) for epichlorhydrin.

NIOSH recommendation for epichlorhydrin: 2 mg/m^3 (0.5 ppm)(ref. 10).

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2×10^3 µg/m^3 (0.5 ppm)

Water, Health: $15 \times 2 \times 10^3 = 3.0 \times 10^4$ µg/ℓ

Land, Health: $0.2 \times 3.0 \times 10^4 = 6.0 \times 10^3$ µg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ µg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200$ µg/g

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2/420 = 4.8$ µg/m^3

$EPC_{AH1a} = 0.5/420 = 0.001$ ppm

$EPC_{WH1} = 15 \times 4.8 = 72$ µg/ℓ

$EPC_{WH2} = 13.8 \times 2 = 27.6$ µg/ℓ

$EPC_{LH} = 0.2 \times 27.6 = 5.5$ µg/g

$EPC_{WE1} = 50 \times 10 = 500$ µg/ℓ

$EPC_{LE} = 0.2 \times 500 = 100$ µg/g

*Based on NIOSH recommendation for 1-chloro-2,3-epoxypropane (epichlorhydrin).

MULTIMEDIA ENVIRONMENTAL GOALS

04A060
1-CHLORO-1,3-EPOXYPROPANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal* †		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.0E3 (0.5)		5 (0.001)		
Water, $\mu g/l$ (ppm Wt)			3.0E4	1.0E3	28	500	
Land, $\mu g/g$ (ppm Wt)			6.0E3	2.0E2	6	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated † Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			5 (0.001)		
Water, $\mu g/l$ (ppm Wt)			28	500	
Land, $\mu g/g$ (ppm Wt)			6	100	

†Based on data for epichlorhydrin.

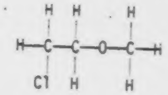
CATEGORY: 4A

2-CHLOROETHYLMETHYL ETHER: C_3H_7ClO. 04A080

A colorless liquid.

WLN:

STRUCTURE:



$$\begin{array}{ccccccccc} & & H & & H & & & & H & & \\ H & - & C & - & C & - & O & - & C & - & H \\ & & Cl & & H & & & & H & & \end{array}$$

PROPERTIES:

Molecular wt: 94.54; pb: 92-93; d: $1,0345^{20}_{4}$; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 2-chloroethylmethyl ether are not available at this time. Acute toxicity may be similar to that of chloromethyl methyl ether.

LD_{50} (oral, rat): 817 mg/kg for chloromethyl methyl ether.

Several haloethers (including chloromethyl methyl ether) are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkyl ethers, including chloromethyl and chloroethyl ethers, are listed on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

04A080
2-CHLOROETHYL METHYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

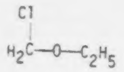
CATEGORY: 4A

CHLOROMETHYL ETHYL ETHER: C_3H_7ClO. 04A100

A liquid.

WLN:

STRUCTURE:



$$\overset{Cl}{H_2C}-O-C_2H_5$$

PROPERTIES:

Molecular wt: 94.54; bp: 83 at 763 mm; d: 1.0372_4^0

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for chloromethyl ethyl ether are not available at this time. Acute toxicity may be similar to that of chloromethyl methyl ether.

LD_{50} (oral, rat): 817 mg/kg for chloromethyl methyl ether.

Several haloethers (including chloromethyl methyl ether) are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloromethyl ethers, including chloromethyl and chloroethyl ethers, are listed on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

04A100
CHLOROMETHYL ETHYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

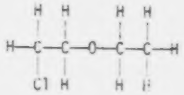
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 4A

WLN:

2-CHLOROETHYL ETHYL ETHER: C_4H_9ClO
(2-chloro-diethyl ether). 04A120
A liquid.

STRUCTURE:



$$\mathrm{H-\underset{Cl}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-O-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H}$$

PROPERTIES:

Molecular wt: 108.57; bp: 107-108; d: 0.9894^{20}_{4}; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for chloroethyl ethyl ether are not available. Acute toxicity may be similar to that of chloroethyl vinyl ether.

LD_{50} (oral, rat): 250 mg/kg for 2-chloroethyl vinyl ether (ref. 4).

LC_{Lo} (inhalation, rat): 250 ppm for 4 hours for 2-chloroethyl vinyl ether (ref. 4).

Several haloethers, including chloromethyl methyl ether, are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkyl ethers, including 2-chloroethyl vinyl ether, are listed on the EPA Consent Decree List, Priority 1.

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 250 = 1.1 \times 10^4$ μg/m^3

Water, Health: $15 \times 1.1 \times 10^4 = 1.7 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 1.7 \times 10^5 = 3.4 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

* ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 250 = 27$ μg/m^3

$EPC_{AH3} = 0.081 \times 250 = 20$ μg/m^3

$EPC_{WH1} = 15 \times 20 = 300$ μg/ℓ

$EPC_{WH2} = 0.4 \times 250 = 100$ μg/ℓ

$EPC_{LH} = 0.2 \times 100 = 20$ μg/g

*Based on acute toxicity data for 2-chloroethyl vinyl ether.

MULTIMEDIA ENVIRONMENTAL GOALS

04A120
2-CHLOROETHYL ETHYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects†	Based on Ecological Effects	Based on Health Effects†	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.1E4		20		
Water, μg/l (ppm Wt)			1.7E5		100		
Land, μg/g (ppm Wt)			3.4E4		20		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects†	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			20		
Water, μg/l (ppm Wt)			100		
Land, μg/g (ppm Wt)			20		

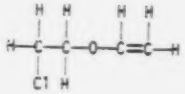
†Based on acute toxicity data for 2-chloroethyl vinyl ether.

CATEGORY: 4A

2-CHLOROETHYL VINYL ETHER: C_4H_7ClO.
A liquid. 04A140

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 106.55; bp: 109 at 740 mm; d: 1.0525.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2-Chloroethyl vinyl ether is used as an intermediate in chemical reactions and in the manufacture of polymers (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 250 mg/kg (ref. 4).

LC_{Lo} (inhalation, rat): 250 ppm for 4 hours (ref. 4).

Several haloethers, including chloromethyl methyl ether) are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkyl ethers, including 2-chloroethyl vinyl ether, are listed on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 250 = 1.1 \times 10^4$ μg/m³

Water, Health: $15 \times 1.1 \times 10^4 = 1.7 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 1.7 \times 10^5 = 3.4 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 250 = 27$ μg/m³

$EPC_{AH3} = 0.081 \times 250 = 20$ μg/m³

$EPC_{WH1} = 15 \times 20 = 300$ μg/ℓ

$EPC_{WH2} = 0.4 \times 250 = 100$ μg/ℓ

$EPC_{LH} = 0.2 \times 100 = 20$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

04A140
2-CHLOROETHYL VINYL ETHER

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.1E4		20		
Water, $\mu g/l$ (ppm Wt)			1.7E5		100		
Land, $\mu g/g$ (ppm Wt)			3.4E4		20		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

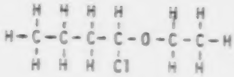
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			20		
Water, $\mu g/l$ (ppm Wt)			100		
Land, $\mu g/g$ (ppm Wt)			20		

CATEGORY: 4A

α-CHLOROBUTYL ETHYL ETHER: $C_6H_{13}ClO$. 04A160

WLN:

STRUCTURE:



$H-CH_2-CH_2-CH_2-CHCl-O-CH_2-CH_2-H$

PROPERTIES:

Molecular wt: 136.62

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for α-chlorobutyl ethyl ether are not available at this time.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

04A160
α-CHLOROBUTYL ETHYL ETHER

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

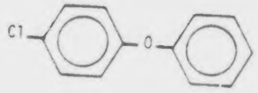
CATEGORY: 4A

4-CHLOROPHENYL PHENYL ETHER: $C_{12}H_9ClO$

A water-clear, oily liquid. 04A180

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 204.5; bp: 153; d: 1.19_4^{20}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

The chlorinated phenyl ethers present serious industrial handling hazards, the toxicity increasing with the degree of chlorination (ref. 7). The monochlorinated compounds do not present serious hazards as do the higher chlorinated ethers (ref. 2).

The feeding of 1.9 g/kg to rabbits over 29 days produced no effect (ref. 2).

Oral lethal dose for guinea pigs is 0.6 to 0.7 g/kg (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Haloethers, including 4-chlorophenyl phenyl ether, are included in the EPA Consent Decree List, Priority 2.

TLV = 0.5 mg/m^3 for chlorinated diphenyl oxides containing 54 and 57% chlorine.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 600 = 2.7 \times 10^4\ \mu g/m^3$

Water, Health: $15 \times 2.7 \times 10^4 = 4.1 \times 10^5\ \mu g/\ell$

Land, Health: $0.2 \times 4.1 \times 10^5 = 8.1 \times 10^4\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 600 = 64\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 600 = 48.6\ \mu g/m^3$

$EPC_{WH1} = 15 \times 48.6 = 729\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 600 = 240\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 240 = 48\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

04A180
4-CHLOROPHENYL PHENYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.7E4		49		
Water, μg/l (ppm Wt)			4.1E5		240		
Land, μg/g (ppm Wt)			8.1E4		48		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			49		
Water, μg/l (ppm Wt)			240		
Land, μg/g (ppm Wt)			48		

CATEGORY: 4A

4-BROMOPHENYL PHENYL ETHER: $C_{12}H_9BrO$. 04A200
(4-bromodiphenyl ether)

WLN:

STRUCTURE:

PROPERTIES:

Molecular wt: 249.11; mp: 18.7; bp: 310; d: $1,4208_4^{20}$; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 4-bromophenyl phenyl ether are not available at this time. Effects are probably similar to those of 4-chlorophenyl phenyl ether. Lethal dose (oral, guinea pig): 600 mg/kg for 4-chlorophenyl phenyl ether.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Haloethers, including 4-bromophenyl phenyl ether, are included in the EPA Consent Decree List, Priority 2.

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 600 = 2.7 \times 10^4$ μg/m^3

Water, Health: $15 \times 2.7 \times 10^4 = 4.1 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 4.1 \times 10^5 = 3.1 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 600 = 64$ μg/m^3

$EPC_{AH3} = 0.081 \times 600 = 48.6$ μg/m^3

$EPC_{WH1} = 15 \times 48.6 = 729$ μg/ℓ

$EPC_{WH2} = 0.4 \times 600 = 240$ μg/ℓ

$EPC_{LH} = 0.2 \times 240 = 48$ μg/g

*Based on acute toxicity data for 4-chlorophenyl phenyl ether.

MULTIMEDIA ENVIRONMENTAL GOALS

04A200
4-BROMOPHENYL PHENYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal* †		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.7E4		49		
Water, $\mu g/l$ (ppm Wt)			4.1E5		240		
Land, $\mu g/g$ (ppm Wt)			8.1E4		48		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			49		
Water, $\mu g/l$ (ppm Wt)			240		
Land, $\mu g/g$ (ppm Wt)			48		

†Based on acute toxicity data for 4-chlorophenyl phenyl ether.

REFERENCES: CATEGORY 4A

Halogenated Ethers and Epoxides - Monohalogenated Ethers and Epoxides

1. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 4, Lyon, France. A World Health Organization (WHO), Geneva (1974).

2. Hake, C. L., and V. K. Rowe. Ethers. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2. F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

3. Van Duuren, B. L. Tumor-Promoting and Co-Carcinogenic Agents in Chemical Carcinogenesis. Chemical Carcinogens. C.E. Searle, Ed., Washington, DC (1976).

4. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

5. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

6. Hine, C. H., and V. K. Rowe. Epoxy Compounds. Industrial Hygiene and Toxicology, Second Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

7. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

8. Pierce, Arleen. Use of 1-Chlorotrimethylene Oxide as A Vapor Phase Sterilant. J. of Am. Chem. Soc. 11: 3395 (1975).

9. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29, Code of Federal Regulations, Part 1910.

10. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Epichlorhydrin. National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare. HEW Publication No. (NIOSH) 76-206 (1976).

CATEGORY 4

HALOGENATED ETHERS AND EPOXIDES

SUBCATEGORY: 4B - Dihalogenated and Polyhalogenated Ethers

Summary of Subcategory

Total number of compounds in subcategory	6
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	2
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: 6

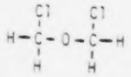
04B020	1,1'-Dichloromethyl ether
04B040	1,1'-Dichlorodiethyl ether
04B060	1,2-Dichloroethyl ethyl ether
04B080	2,2'-Dichlorodiethyl ether
04B100	2,2'-Dichlorodiisopropyl ether
04B120	1,2-Dichlorodiisobutyl ether

CATEGORY: 4B

1,1'-DICHLOROMETHYL ETHER: $C_2H_4Cl_2O$ (oxy bis[chloromethane], bis(chloromethyl)ether). 048020
A colorless, volatile liquid with a suffocating odor.

WLN: GIOIG

STRUCTURE:



$$H-\overset{Cl}{\underset{H}{C}}-O-\overset{Cl}{\underset{H}{C}}-H$$

PROPERTIES:

Molecular wt: 114.96; bp: 105; d: 1.328^{15}_{4}; vap. d: 4.0; decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,1'-Dichloromethyl ether does not occur in nature as such. It can be formed from the reaction of HCOH and HCl in air in low ppb levels when HCOH and HCl are present in 500 to 10,000 ppm (ref. 1). Photochemical reactions are not likely as there is little or no absorption in the solar region (ref. 1). In water, 1,1'-dichloromethyl ether decomposes into HCl and HCOH (ref. 2). Its half-life in water is 10 to 40 seconds (ref. 1).

In moist air (70 percent relative humidity), concentrations from 10 to 100 ppm are stable for 18 hr (ref. 2). It has been reported in water in one city at 0.5 μg/l (ref. 3).

It is probable that the half-lives in soil and soil organisms are short, and that food chain transfers are consequently nonexistent (ref. 1).

1,1'-Dichloromethyl ether is used in the preparation of textile aids, and in the preparation of anion exchange resins (ref. 4). It can be detected with high resolution mass spectroscopy down to 0.1 ppb (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 210 mg/kg (ref. 5);

LC_{50} (inhalation, rat): 7 ppm/4 hr (ref. 5); (mouse): 25 mg/m^3/6 hours.

Exposure to 1,1'dichloromethyl ether may constitute a lung cancer risk among workers exposed to it as a contaminant in the manufacture of chloromethyl methyl ether (refs. 2,4). There were six cases of lung cancer reported among 18 males in a testing laboratory, and two cases out of 50 production workers. Both groups were exposed for 6 to 9 years with the latent period from first exposure to diagnosis from 8 to 16 years (ref. 1).

The EPA/NIOSH ordering number based on carcinogenicity is 7327. The lowest effective dosage is 50 mg/kg. The adjusted ordering number is 147.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.005 mg/m^3 (0.001 ppm). This TLV recognizes the carcinogenic potential of 1,1'-dichloromethyl ether (ref. 4). It is designated a human carcinogen by the ACGIH.

1,1'-Dichloromethyl ether is on the EPA Consent Decree List, Priority 1.

bis-Chloromethyl ether is the subject of a NIOSH Hazard Review Document (ref. 6). It is designated a cancer suspect agent by OSHA. Special precautions for exposed workers are prescribed (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	5 $\mu g/m^3$ (0.001 ppm)	Air, Ecology:	
Water, Health:	15 x 5 = 75 μg/l	Water, Ecology:	
Land, Health:	0.2 x 75 = 15 μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH2} = 0.107 x 210 = 22.5 $\mu g/m^3$

EPC_{AH3} = 0.081 x 210 = 17.0 $\mu g/m^3$

EPC_{WH1} = 15 x 17 = 255 μg/l

EPC_{WH2} = 0.4 x 210 = 84 μg/l

EPC_{LH} = 0.2 x 84 = 17 μg/g

EPC_{AC1} = 10^3 x 0.005/420 = 0.01 $\mu g/m^3$

EPC_{AC1a} = 0.001/420 = 2.4 x 10^{-6} ppm

EPC_{AC2} = 10^3/(6 x 147) = 1 $\mu g/m^3$

EPC_{WC} = 15 x 0.01 = 0.15 μg/l

EPC_{LC} = 0.2 x 0.15 = 0.03 μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

XXX

04B020

1,1'-DICHLOROMETHYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E0 (0.001)		0.01 (2.4×10^{-6})		
Water, $\mu g/l$ (ppm Wt)			7.5E1		0.15		
Land, $\mu g/g$ (ppm Wt)			1.5E1		0.03		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			17.0		0.01 (2.4×10^{-6})
Water, $\mu g/l$ (ppm Wt)			84		0.15
Land, $\mu g/g$ (ppm Wt)			17		0.03

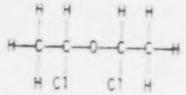
CATEGORY: 4B

1,1'-DICHLORODIETHYL ETHER: $C_4H_8Cl_2O$. 048040

A colorless liquid.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 143.02; bp: 116-117; d: 1.1060_4^{25}; decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Acute toxicity data for 1,1'-dichlorodiethyl ether is currently unavailable. Toxicity is probably similar to that of 2,2'-dichlorodiethyl ether.

LD_{50} (oral, rat): 75 mg/kg for 2,2'-dichlorodiethyl ether (ref. 5).

Evidence of carcinogenicity: 1,1'-dichlorodiethyl ether is reported to produce tumors in mice. The EPA/NIOSH ordering number is 3101. The lowest effective dosage is 2400 mg/kg. The adjusted ordering number 1.3.

Aquatic toxicity: TLm 96: 1,000 - 100 ppm for 2,2'-dichlorodiethyl ether (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkyl ethers, including chloroethyl ethers, are listed in the EPA Consent Decree List, Priority 1.

TLV for 2,2'-dichlorodiethyl ether = 30 mg/m^3 (5 ppm).

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.0×10^4 μg/m^3 (5 ppm)

Water, Health: $15 \times 3.0 \times 10^4 = 4.5 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 4.5 \times 10^5 = 9.0 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 30/420 = 71$ μg/m^3

$EPC_{AH1a} = 5/420 = 0.01$ ppm

$EPC_{WH1} = 15 \times 71 = 1{,}070$ μg/ℓ

$EPC_{WH2} = 13.8 \times 30 = 414$ μg/ℓ

$EPC_{LH} = 0.2 \times 414 = 83$ μg/g

$EPC_{AC2} = 10^3/(6 \times 1.3) = 128$ μg/m^3

$EPC_{WC} = 15 \times 128 = 1{,}923$ μg/ℓ

$EPC_{LC} = 0.2 \times 1{,}923 = 385$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/ℓ

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

*Acute toxicity values based on TLV for 2,2'-dichlorodiethyl ether. Eculogy values based on data for 2,2'-dichlorodiethyl ether.

MULTIMEDIA ENVIRONMENTAL GOALS

04B040

1,1'-DICHLORODIETHYL ETHER

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal* †		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.0E4		71 (0.01)		
Water, μg/l (ppm Wt)			4.5E5	1.0E4	414	5,000	
Land, μg/g (ppm Wt)			9.0E4	2.0E3	83	1,000	

*To be multiplied by dilution factor

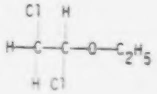
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration †		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			71 (0.01)		128
Water, μg/l (ppm Wt)			414	5,000	1,923
Land, μg/g (ppm Wt)			83	1,000	385

† Based on data for 2,2'-dichlorodiethyl ether.

CATEGORY: 4B
1,2-DICHLOROETHYL ETHYL ETHER: $C_4H_8Cl_2O$. 048060
A colorless liquid.

WLN:

STRUCTURE:



$\mathrm{H{-}\overset{Cl}{\underset{H}{C}}{-}\overset{H}{\underset{Cl}{C}}{-}O{-}C_2H_5}$

PROPERTIES:

Molecular wt: 143.02; bp: 145; d: 1.1370^{20}_{4}; decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Several haloethers are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkly ethers, including chloroethyl ethers, are listed in the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

04B060
1,2-DICHLOROETHYL ETHYL ETHER

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, µg/m^3 (ppm Vol)							
Water, µg/l (ppm Wt)							
Land, µg/g (ppm Wt)							

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m^3 (ppm Vol)					
Water, µg/l (ppm Wt)					
Land, µg/g (ppm Wt)					

CATEGORY: 4B

WLN: G202G

2,2'-DICHLORODIETHYL ETHER: $C_4H_8Cl_2O$ (bis(2-chloroethyl)ether, 1,1'-oxybis(2-chloroethane)).
A colorless, clear liquid with a pungent odor. 04B080

STRUCTURE:

$Cl\text{-}CH_2\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_2\text{-}Cl$

PROPERTIES:

Molecular wt: 143.02; mp: -51.7; bp: 178; d: 1.2199^{20}_{4};
vap. press: 1.4 mm at 25; vap. d: 4.93; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

All ethers tend to form explosive peroxides. The odor of 2,2'-dichlorodiethyl ether is easily detected at concentrations of 35 ppm (ref. 8).

2,2'-Dichlorodiethyl ether has been identified in samples from public drinking water supplies in concentrations of 0.42 µg/ℓ (ref. 3).

It is used in scouring of textiles, in purification of oils, and as an insecticidal soil fumigant (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

2,2'-Dichlorodiethyl ether acts as an irritant to eyes and upper respiratory tract and affects the kidneys and liver in varying degrees. It is absorbed through the skin (refs. 8, 10). Concentrations of 35 ppm are nearly free of irritative effects (ref. 8).

LD_{50} (oral, rat): 75 mg/kg (ref. 5).

LC_{Lo} (inhalation, rat): 1,000 ppm/45 min (ref. 5).

2,2'-Dichlorodiethyl ether is reported to produce tumors in mice. The EPA/NIOSH ordering number is 3111. The lowest dose to induce a carcinogenic response is reported as 33 gm/kg. The adjusted ordering number is 0.09.

Aquatic toxicity: TLm 96: 1,000 - 100 ppm (ref. 5).

Phytotoxicity: The compound is reported to be very phytotoxic and should be used only on bare soil (ref. 9).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 30 mg/m^3 (5 ppm).
EPA Consent Decree Priority I List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.0×10^4 $\mu g/m^3$ (5 ppm)
Water, Health: $15 \times 3.0 \times 10^4 = 4.5 \times 10^5$ µg/ℓ
Land, Health: $0.2 \times 4.5 \times 10^5 = 9.0 \times 10^4$ µg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ µg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 30/420 = 71$ $\mu g/m^3$
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 71 = 1{,}070$ µg/ℓ
$EPC_{WH2} = 13.8 \times 30 = 414$ µg/ℓ
$EPC_{LH} = 0.2 \times 414 = 83$ µg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ µg/ℓ

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

04B080
2,2'-DICHLORODIETHYL ETHER

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.0E4		71 (0.01)		
Water, μg/l (ppm Wt)			4.5E5	1.0E4	414	5,000	<0.4†
Land, μg/g (ppm Wt)			9.0E4	2.0E3	83	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			71 (0.01)		
Water, μg/l (ppm Wt)			414	5,000	
Land, μg/g (ppm Wt)			83	1,000	

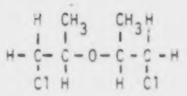
†Public drinking water.

CATEGORY: 4B

2,2'-DICHLORODIISOPROPYL ETHER: $C_6H_{12}Cl_2O$. 04B100
(bis-(2-chloro-1-methylethyl)ether), bis(α-chloroisopropyl)ether).

WLN:

STRUCTURE:



PROPERTIES:

Molecular weight: 171.016

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Di-2-chloroisopropyl ether is a byproduct in the manufacturing of propylene glycol. The compound has commercial use as a solvent for fats, greases, and waxes. It is also used in the manufacture of dyes, resins, and pharmaceuticals (ref. 10).

Di-2-chloroisopropyl ether was identified as the major organic component in the carbon chloroform extract of Evansville, Indiana municipal drinking water. The compound was not easily removed from drinking water by conventional technology (ref. 11). compound appears to be widespread in U.S. rivers (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

Di-2-chloroisopropyl ether is reported to be less toxic, orally and by inhalation, than dichloroethyl ether. Deleterious effects of di-2-chloroisopropyl ether are found in the liver and kidneys. Although the compound is readily absorbed through the skin, it has little effect on it (ref. 10)

LD_{50} (oral, rat): 240 mg/kg (ref. 5).

LC_{Lo} (inhalation, rat): 700 ppm for 5 hours (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 240 = 1.08 \times 10^4$ μg/m³ Air, Ecology:

Water, Health: $15 \times 1.08 \times 10^4 = 1.62 \times 10^5$ μg/l Water, Ecology:

Land, Health: $0.2 \times 1.62 \times 10^5 = 3.24 \times 10^4$ μg/g Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 240 = 25.7$ μg/m³

$EPC_{AH3} = 0.081 \times 240 = 19.4$ μg/m³

$EPC_{WH1} = 15 \times 19.4 = 291$ μg/ℓ

$EPC_{WH2} = 0.4 \times 240 = 96$ μg/ℓ

$EPC_{LH} = 0.2 \times 96 = 19.2$ μg/g

04B100
2,2'-DICHLORODIISOPROPYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.1E4		19		
Water, µg/l (ppm Wt)			1.6E5		96		
Land, µg/g (ppm Wt)			3.2E4		19		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			19		
Water, µg/l (ppm Wt)			96		
Land, µg/g (ppm Wt)			19		

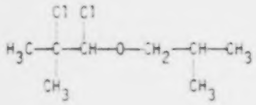
CATEGORY: 4B

1,2-DICHLORODIISOBUTYL ETHER: $C_8H_{16}Cl_2O$ 048120

A liquid.

WLN:

STRUCTURE:



$$H_3C-\underset{CH_3}{\overset{Cl}{C}}-\overset{Cl}{CH}-O-CH_2-\underset{CH_3}{CH}-CH_3$$

PROPERTIES:

Molecular wt: 199.12; bp: 192.5; d: 1.031^{5}_{4}; decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 1,2-dichlorodiisobutyl ether are not available at this time.

Several haloethers are considered potential carcinogens.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloroalkyl ethers are listed in the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

04B120
1,2-DICHLORODIISOBUTYL ETHER

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

REFERENCES: CATEGORY 4B

Halogenated Ethers - Dihalogenated and Polyhalogenated Ethers

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3. U.S. Environmental Protection Agency, Office of Toxic Substances. Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress. Environmental Protection Agency, Washington, DC (1975).

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6. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

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CATEGORY 5

ALCOHOLS

SUBCATEGORY: 5A - Primary Alcohols

Summary of Subcategory

Total number of compounds in subcategory	11
number of parent compounds with subspecies	1
number of subspecies	4
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

CATEGORY: 5A

WLN: Q1

METHANOL: CH_4O (methyl alcohol, wood alcohol, carbinol).
A colorless, flammable, mobile liquid. 05A020

STRUCTURE:

CH_3OH

PROPERTIES:

Molecular wt: 32.04; bp: 64.96; mp: -97.8; d: 0.7914 g/ml;
vap. press: 160 mm at 59.4°; miscible with water; vap. d: 1.11.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Methanol is a product of the destructive distillation of wood. Methanol may be formed by the reaction of carbon monoxide and hydrogen in the presence of catalysts. Rural concentration in air is reported as 1.2 ppb (ref. 1). This is equivalent to 1.6 $\mu g/m^3$. The odor recognition level for methanol is reported to be as low as 4.8 mg/m^3 (ref. 2). Methanol is a common air contaminant. It is used as a food additive permitted in foods for human consumption (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methanol possesses narcotic properties and is an irritant to the mucous membranes. It is considered a cumulative poison due to the low rate of excretion once it is absorbed. In the body, methanol is oxidized to formaldehyde and formic acid; both these metabolites are toxic. Methanol mainly affects the nervous system, particularly the optic nerve. Severe exposures may eventually cause death or blindness (ref. 3).

Methanol is absorbed through the skin. The lowest lethal oral dose for humans is listed as 340 mg/kg. Ingestion of 100 mg/kg by humans has resulted in effects to the eyes; inhalation of 300 ppm has resulted in effects to the central nervous system (ref. 4). The biological half-life for methanol is reported as 0.289 days or about 7 hours (ref. 5).

LD_{50} (oral, rat): 13 g/kg.

LC_{50} (inhalation, monkey): 1,000 ppm.

Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 260 mg/m^3 (200 ppm).

Methanol is the subject of a NIOSH Criteria Document; recommended standard is 200 ppm with a ceiling of 800 ppm (ref. 6).

Listed on Second Priority Chemical List of the Chemical Industry Institute of Toxicology (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.6×10^5 $\mu g/m^3$ (200 ppm)
Water, Health: $15 \times 2.6 \times 10^5 = 3.9 \times 10^6$ $\mu g/l$
Land, Health: $0.2 \times 3.9 \times 10^6 = 7.8 \times 10^5$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 260/420 = 619$ $\mu g/m^3$
$EPC_{AH1a} = 200/420 = 0.5$ ppm
$EPC_{WH1} = 15 \times 619 = 9{,}300$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 260 = 3{,}600$ $\mu g/l$
$EPC_{LH} = 0.2 \times 3{,}600 = 720$ $\mu g/g$

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ $\mu g/l$

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ $\mu g/g$

05A020
METHANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.6E5 (200)		619 (0.5)		1.6
Water, $\mu g/l$ (ppm Wt)			3.9E6	1.0E5	3,600	50,000	
Land, $\mu g/g$ (ppm Wt)			7.8E5	2.0E4	720	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			619 (0.5)		
Water, $\mu g/l$ (ppm Wt)			3,600	50,000	
Land, $\mu g/g$ (ppm Wt)			720	10,000	

CATEGORY: 5A

WLN: Q2

ETHANOL: C_2H_6O (ethyl alcohol, grain alcohol).
A clear, flammable, colorless, fragrant liquid with a burning taste. 05A040

STRUCTURE:

CH_3CH_2OH

PROPERTIES:

Molecular wt: 46.07; bp: 78.5; mp: -116; d: 0.7893;
vap. press: 275 mm at 54.8°; completely miscible with water;
vap. d: 1.59.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethanol is produced commercially by the fermentation of grains or molasses. Ingestion causes an inebriating effect.

Rural concentration in air is reported as 1.2 ppb (ref. 1). This is equivalent to 2.25 $\mu g/m^3$.

The odor recognition level for ethanol in air is 21-93 mg/m^3 (ref. 2).

Ethanol has been identified in samples from public water supplies in concentrations of 5 μg/l (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Ethanol is rapidly oxidized in the body, mainly to carbon dioxide and water. Cumulative effects do not occur, but repeated ingestion can lead to chronic alcoholism. Exposure to concentrations over 1,000 ppm may cause headaches, irritation to upper respiratory tract and eyes, and drowsiness and inability to concentrate (ref. 3). The lowest lethal dose reported for humans is 2,000 mg/kg. The lowest toxic dose reported is 50 mg/kg (ref. 4). The biological half-life for ethanol is reported as 10 hours (ref. 9).

LD_{50} (oral, rat): 13.7 g/kg (ref. 3).

Carcinogenic effects in mice have been observed as a result of large doses. The EPA/NIOSH ordering number is 3112. The lowest dose resulting in a carcinogenic effect is 100 gm/kg. The adjusted ordering number is 0.03. The compound is not considered a highly active carcinogen.

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,900 mg/m^3 (1,000 ppm) (based primarily on irritative rather than toxic properties).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.9×10^6 $\mu g/m^3$ (1000 ppm)
Water, Health: $15 \times 1.9 \times 10^6 = 2.9 \times 10^7$ μg/l
Land, Health: $0.2 \times 2.9 \times 10^7 = 5.8 \times 10^6$ μg/g

Air, Ecology:
Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1{,}900/420 = 4{,}520$ $\mu g/m^3$
$EPC_{AH1a} = 1{,}000/420 = 2.4$ ppm
$EPC_{WH1} = 15 \times 4{,}520 = 68{,}000$ μg/l
$EPC_{WH2} = 13.8 \times 1{,}900 = 26{,}000$ μg/l
$EPC_{LH} = 0.2 \times 26{,}000 = 5{,}200$ μg/g

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ μg/l

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ μg/g

05A040
ETHANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.9E6 (1,000)		4,520 (2.4)		2.25
Water, μg/l (ppm Wt)			2.9E7	1.0E5	26,000	50,000	<5†
Land, μg/g (ppm Wt)			5.8E6	2.0E4	52,000	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			4,520 (2.4)		
Water, μg/l (ppm Wt)			26,000	50,000	
Land, μg/g (ppm Wt)			5,200	10,000	

†Public drinking water.

CATEGORY: 5A

WLN: Q3

1-PROPANOL: C_3H_8O (n-propyl alcohol, 1-hydroxypropane).
A colorless, volatile liquid. 05A060

STRUCTURE:

$CH_3CH_2CH_2OH$

PROPERTIES:

Molecular wt: 60.09; bp: 97.1; mp: -126.1;
d: 0.8044; vap. press.: 198 mm (65.94° C); very
soluble in water; vap. d: 2.08.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

In industrial areas, ambient concentration of 1-propanol is reported as 61.8 ppm, or 152 mg/m^3 (ref. 1).

Propanol is not used as extensively as other alcohols; uses include solvents, synthetic resins, laquers, cleaners, and pharmaceuticals (ref. 10).

Propanol has been identified in samples from public drinking water supplies at a concentration of 1.0 $\mu g/\ell$ (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Propanol is slightly more toxic than 2-propanol, which is not considered an important toxic hazard (ref. 3). The principal action of 1-propanol is that of a mild narcotic (ref. 11). Depressant action is similar to ethyl alcohol (ref. 12).

Ingestion of 5,700 mg/kg of 1-propanol resulted in death for a human (ref. 4).

LD_{50}(oral, rat): 1,870 mg/kg.

LC_{Lo}(inhalation, rat): 4,000 ppm/4 hr.

The compound has produced carcinogenic effects in rats at very high dosages. The EPA/NIOSH ordering number is 4112. The lowest dosage to produce a carcinogenic response is reported as 6 g/kg. The adjusted ordering number is 0.7. Propanol is not considered a highly active carcinogen.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 500 mg/m^3 (200 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $5.0 \times 10^5\ \mu g/m^3$ (200 ppm)
Water, Health: $15 \times 5.0 \times 10^5 = 7.5 \times 10^6\ \mu g/l$
Land, Health: $0.2 \times 7.5 \times 10^6 = 1.5 \times 10^6\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/l$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 500/420 = 1,200\ \mu g/m^3$
$EPC_{AH1a} = 200/420 = 0.5$ ppm
$EPC_{WH1} = 15 \times 1,200 = 18,000\ \mu g/l$
$EPC_{WH2} = 13.8 \times 500 = 5,900\ \mu g/l$
$EPC_{LH} = 0.2 \times 6,900 = 1,380\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000\ \mu g/l$

$EPC_{LE} = 0.2 \times 5,000 = 1,000\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

05A060
1-PROPANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			5.0E5 (200)		1,200 (0.5)		152,000 (61.8)†
Water, μg/l (ppm Wt)			7.5E6	1.0E4	6,900	5,000	1‡
Land, μg/g (ppm Wt)			1.5E6	2.0E3	1,380	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			1,200 (0.5)		
Water, μg/l (ppm Wt)			6,900	5,000	
Land, μg/g (ppm Wt)			1,380	1,000	

†Value is reported for industrial areas. No rural concentration is reported.
‡Public drinking water.

CATEGORY: 5A

n-BUTANOL: $C_4H_{10}O$ (butyl alcohol, 1-butanol).
A colorless, volatile liquid. 05A030

WLN: Q4

STRUCTURE:

$CH_3CH_2CH_2CH_2OH$

n-Butanol

PROPERTIES:

Molecular wt: 74.12; mp: -79.9; bp: 117.7;
d: $.8109^{20}_{20}$; vap. d: 2.56; vap. press.: 6.5 mm at 25°;
solubility: 7.7 percent in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The rural concentration for n-butanol is reported as 126 ppb (ref. 1). This is equivalent to 381 $\mu g/m^3$. The odor recognition level for n-butanol is reported as 33 mg/m^3 (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Due to low volatility, few cases of poisoning in industry have been reported. Toxic effects of n-butanol include eye irritation with corneal inflammation, slight headache and dizziness, slight irritation of nose and throat, and dermatitis on fingers (ref. 3). No narcotic or irritative effects are anticipated at 100 ppm (302 mg/m^3) (ref. 11), although inhalation by humans at 25 ppm (76 mg/m^3) has been reported to cause irritative effects (ref. 4).

LD_{50} (oral, rat): 790 mg/kg.
LC_{50} (inhalation, rat): 73,000 ppm for 4 hours (ref. 11).
Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 150 mg/m^3 (50 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.50×10^5 $\mu g/m^3$ (50 ppm)
Water, Health: $15 \times 1.5 \times 10^5 = 2.25 \times 10^6$ $\mu g/l$
Land, Health: $0.2 \times 2.25 \times 10^6 = 4.5 \times 10^5$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 150/420 = 357$ $\mu g/m^3$
$EPC_{AH1a} = 50/420 = 0.12$ ppm
$EPC_{WH1} = 15 \times 357 = 5,400$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 150 = 2,070$ $\mu g/l$
$EPC_{LH} = 2.0 \times 2,070 = 400$ $\mu g/g$

$EPC_{WE1} = 50 \times >1,000 = >50,000$ $\mu g/l$

$EPC_{LE} = 2.0 \times 50,000 = 10,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

05A080
n-BUTANOL

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.5E5 (50)		357 (0.12)		381
Water, μg/l (ppm Wt)			2.3E6	1.0E5	2,070	50,000	
Land, μg/g (ppm Wt)			4.5E5	2.0E4	400	10,000	

*To be multiplied by dilution factor

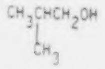
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			357 (0.12)		
Water, μg/l (ppm Wt)			2,070	50,000	
Land, μg/g (ppm Wt)			400	10,000	

CATEGORY: 5A

WLN:

ISOBUTYL ALCOHOL: $C_4H_{10}O$ (2-methyl-1-propanol, isobutanol). A clear, sweet-smelling liquid. 05A100

STRUCTURE:



$CH_3CH(CH_3)CH_2OH$

2-Methyl-1-propanol
(Isobutyl alcohol)

PROPERTIES:

Molecular wt: 74.12; bp: 108.3; fp: -108; d: 0.8032^{20}_{20}; vap. d: 2.56; vap. press.: 12.2 mm at 25°; solubility: 10 percent in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Isobutyl alcohol has a higher vapor pressure than 1-butanol; hence, under similar conditions, higher concentrations of isobutyl alcohol will be encountered (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

Isobutyl alcohol is considered more toxic than 1-butanol (ref. 11). It may be a skin irritant (ref. 10). Effects of exposure to high air concentrations have caused eye and throat irritation, loss of appetite and weight, and corneal effects (ref. 10). It acts as a narcotic in high concentrations (ref. 12).

LD_{50} (oral, rat): 2,460 mg/kg.

LC_{Lo} (inhalation, rat): 8,000 ppm for 4 hours.

Isobutyl alcohol has produced carcinogenic effects in rats at very high dosages. The EPA/NIOSH ordering number is 4112. The lowest dose to produce carcinogenic effects is 9 g/kg. The adjusted ordering number is 0.5. The compound is not considered a highly active carcinogen.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 150 mg/m^3 (50 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.50×10^5 $\mu g/m^3$ (50 ppm)
Water, Health: $15 \times 1.5 \times 10^5 = 2.25 \times 10^6$ μg/l
Land, Health: $0.2 \times 2.25 \times 10^6 = 4.5 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 150/420 = 357$ $\mu g/m^3$
$EPC_{AH1a} = 150/420 = 0.12$ ppm
$EPC_{WH1} = 15 \times 357 = 5{,}400$ μg/l
$EPC_{WH2} = 13.8 \times 150 = 2{,}070$ μg/l
$EPC_{LH} = 0.2 \times 2{,}070 = 400$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05A100
ISOBUTYL ALCOHOL

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.5E5 (50)		357 (0.12)		
Water, $\mu g/l$ (ppm Wt)			2.3E6	1.0E4	2,070	5,000	
Land, $\mu g/g$ (ppm Wt)			4.5E5	2.0E3	400	10,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			357 (0.12)		
Water, $\mu g/l$ (ppm Wt)			2,070	5,000	
Land, $\mu g/g$ (ppm Wt)			400	1,000	

CATEGORY: 5A

PENTANOLS, (primary): $C_5H_{12}O$ (amyl alcohols). 05A120

n-PENTANOL: (1-pentanol) clear liquid, mild characteristic odor. 05A121
2-METHYL-1-BUTANOL: liquid. 05A122
2,2-DIMETHYL-1-PROPANOL: volatile crystals, peppermint odor. 05A123
3-METHYL-1-BUTANOL: liquid; characteristic, disagreeable odor; repulsive taste; poisonous vapors. 05A124

PROPERTIES:

	molecular wt.	bp	mp	d	solubility	vap. press.	vap.d
n-pentanol	88.15	137.5	-79	0.815	slightly	1 mm at 13.6°	3.04
2-methyl-1-butanol	88.15	128		0.816	slightly	-	3.00
2,2-dimethyl-1-propanol	88.15	114	53	0.812	slightly	16 mm at 20°	
3-methyl-1-butanol	88.15	132	-117.2	0.813	slightly	1 mm at 10°	3.04

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Pentanols are present in fusel oils. They are obtained by fractionation of fusel oil and from pentane by chlorination and hydrolysis (ref. 9).

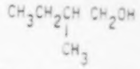
Amyl alcohols are used in the manufacture of lacquers, chemicals, rubber, fruit essences, and explosives (ref. 9). 3-Methyl-1-butanol is used in the manufacture of artificial silk, smokeless powders and for determining fat in milk (ref. 12).

Pentanol has been found in samples from public drinking water supplies at concentrations of 1.0 μg/ℓ (ref. 8).

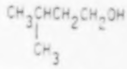
WLN/STRUCTURE:

Q5/$CH_3CH_2CH_2CH_2CH_2OH$

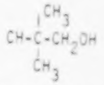
n-Pentanol,
(amyl alcohol)


$CH_3CH_2\underset{|}{\underset{CH_3}{CH}}\,CH_2OH$

Q1Y2/2-Methyl-1-butanol,
(active amyl alcohol)


$CH_3\underset{|}{\underset{CH_3}{CH}}CH_2CH_2OH$

Q2Y/3-Methyl-1-butanol,
(isoamyl alcohol)


$CH\text{-}\overset{CH_3}{\underset{CH_3}{C}}\text{-}CH_2OH$

2,2-Dimethyl-1-propanol,
(neopentyl alcohol)

TOXIC PROPERTIES, HEALTH EFFECTS:

Amyl alcohols are about 4 times as toxic as ethyl alcohol. However, they are absorbed slowly due to low volatility and low solubility in body fluids. Vapors irritate eyes and upper respiratory tract (ref. 3). 2-Methyl-1-butanol can cause giddiness, headache, coughing, nausea, vomiting, deafness, and delerium (ref. 3). 3-Methyl-1-butanol can cause central nervous system depression and narcosis (ref. 12) and has caused irritation in humans at 150 ppm (ref. 4). Inhalation of amyl alcohol vapors can cause human death (ref. 9).

LD_{50} (oral, rat): 3,030 mg/kg for n-pentanol; 4,920 mg/kg for 2-methyl-1-butanol (ref. 4).

At high dosages, 3-methyl-1-butanol has caused tumors in rats. The EPA/NIOSH ordering number is 4112. The lowest dosage producing an oncogenic response is 27 g/kg. The adjusted ordering number is 0.15.

Aquatic toxicity: 96 hr TLm: 1,000 - 100 ppm for n-pentanol (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV (isoamyl alcohol): 360 mg/m^3 (100 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.60×10^5 $\mu g/m^3$ (100 ppm)
Water, Health: $15 \times 3.6 \times 10^5 = 5.4 \times 10^6$ μg/l
Land, Health: $0.2 \times 5.4 \times 10^6 = 1.1 \times 10^6$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 360/420 = 860$ $\mu g/m^3$
$EPC_{AH1a} = 100/420 = 0.24$ ppm
$EPC_{WH1} = 15 \times 860 = 12{,}900$ μg/l
$EPC_{WH2} = 13.8 \times 360 = 5{,}000$ μg/l
$EPC_{LH} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05A120
PENTANOLS (primary)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E5 (100)		860 (0.24)		
Water, $\mu g/l$ (ppm Wt)			5.4E6	1.0E4	5,000	5,000	1†
Land, $\mu g/g$ (ppm Wt)			1.1E6	2.0E3	1,000	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			860 (0.24)		
Water, $\mu g/l$ (ppm Wt)			5,000	5,000	
Land, $\mu g/g$ (ppm Wt)			1,000	1,000	

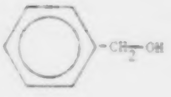
†Public drinking water.

CATEGORY: 5A

BENZYL ALCOHOL: $C_6H_5CH_2OH$ (α-hydroxytoluene, benzene carbinol, benzene methanol, phenylmethyl alcohol, benzoyl alcohol, phenyl methanol, phenylcarbinol, α-toluenol).
A colorless liquid with a faint aromatic odor and a sharp burning taste. 05A140

WLN: Q1R

STRUCTURE:



PROPERTIES:

Molecular wt: 108.15; mp: -15.3; bp: 205.35^{760}; d: 1.0419^{20}_{4}; vap. d: 3.72; vap. press: 0.15 mm Hg at 25°; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Benzyl alcohol is formed by the reaction of benzyl chloride with sodium or potassium carbonate (ref. 10). It is employed in the manufacture of perfumes, pharmaceuticals, and dyestuffs (ref. 10). It is also a constituent of jasmine, hyacinth, ylang-ylang oils, and Peru and Tolu balsams (ref. 12).

Methods for detection in aqueous solution include refractive index, and measurement of the amount of benzoic acid resulting from oxidation with a saturated potassium permanganate solution (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

Seven workers exposed to a lacquer containing 10 percent benzyl alcohol for 1.5 to 2 months developed illness characterized by headache, nausea, diarrhea, and weight loss. The illness disappeared after the persons were removed from the laquer exposure (ref. 10).

Humans and animals readily oxidize benzyl alcohol to benzoic acid, which after conjugating with glycine, is eliminated as hippuric acid in the urine. Within 6 hours after taking 1.5 g of benzyl alcohol orally, human subjects eliminated 75 to 85 percent of the dose in the urine as hippuric acid (ref. 10).

LD_{50} (oral, rat): 1,230 mg/kg (ref. 4).

LC_{50} (inhalation, rat): 1,000 ppm/8 hrs (ref. 4).

Teratogenic effects, including skeletal defects and meningogeles, were reported following the injection of 0.01 or 0.02 ml benzyl alcohol in the the yolk sac of a chick from before incubation up to the 7th day (ref. 13). No adjusted ordering number was calculated because of the unusual route of administration of the dose.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1{,}230 = 5.54 \times 10^4$ μg/m³

Water, Health: $15 \times 5.54 \times 10^4 = 8.31 \times 10^5$ μg/l

Land, Health: $0.2 \times 8.31 \times 10^5 = 1.7 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}230 = 131.6$ μg/m³

$EPC_{AH3} = 0.081 \times 1{,}230 = 99.6$ μg/m³

$EPC_{WH1} = 15 \times 99.6 = 1{,}494$ μg/l

$EPC_{WH2} = 0.4 \times 1{,}230 = 492$ μg/l

$EPC_{LH} = 0.2 \times 492 = 98$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05A140
BENZYL ALCOHOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.5E4		99.6		
Water, $\mu g/l$ (ppm Wt)			8.3E5	1.0E4	492	5,000	
Land, $\mu g/g$ (ppm Wt)			1.7E5	2.0E3	98	1,000	

*To be multiplied by dilution factor

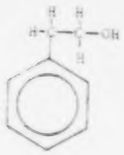
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			99.6		
Water, $\mu g/l$ (ppm Wt)			492	5,000	
Land, $\mu g/g$ (ppm Wt)			98	1,000	

CATEGORY: 5A

PHENETHYL ALCOHOL: $C_8H_{10}O$ (β-phenethyl alcohol, 2-phenyl ethanol, benzyl carbinol)
Colorless liquid; floral odor of roses. 05A160

WLN: Q2R

STRUCTURE:



PROPERTIES:
Molecular wt: 122.17; bp: 218.2; fp: -27; d: 1.0202^{20}_{4}; vap. d: 4.21; vap. press: 1 mm at 58°; solubility in water: 2 percent.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Phenylethyl alcohol is used in perfumes (ref. 10).
It forms styrene on treatment with alkali.
It is found in a number of natural essential oils and has been isolated from a certain fungus (ref. 12).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxic effects to man are not reported.
Phenethyl alcohol is absorbed through the skin of experimental animals. It is a local anesthetic and may cause central nervous system injury (ref. 3).
LD_{50} (oral, rat): 1,790 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1,790 = 8.1 \times 10^4$ μg/m³	Air, Ecology:
Water, Health: $15 \times 8.1 \times 10^4 = 1.2 \times 10^6$ μg/l	Water, Ecology:
Land, Health: $0.2 \times 1.2 \times 10^6 = 2.4 \times 10^5$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1,790 = 192$ μg/m³

$EPC_{AH3} = 0.081 \times 1,790 = 145$ μg/m³

$EPC_{WH1} = 15 \times 145 = 2,175$ μg/l

$EPC_{WH2} = 0.4 \times 1,790 = 716$ μg/l

$EPC_{LH} = 0.2 \times 716 = 143$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05A160
PHENETHYL ALCOHOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			8.1E4		145		
Water, $\mu g/l$ (ppm Wt)			1.2E6		716		
Land, $\mu g/g$ (ppm Wt)			2.4E5		143		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			145		
Water, $\mu g/l$ (ppm Wt)			716		
Land, $\mu g/g$ (ppm Wt)			143		

REFERENCES: CATEGORY 5A

Alcohols - Primary Alcohols

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CATEGORY 5

ALCOHOLS

SUBCATEGORY: 5B - Secondary Alcohols

Summary of Subcategory

Total number of compounds in subcategory	9
number of parent compounds with subspecies	1
number of subspecies	3
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

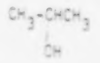
CATEGORY: 5B

2-PROPANOL: C_3H_8O (isopropyl alcohol, 2-hydroxypropane, rubbing alcohol). 058020

A clear, colorless, volatile liquid; faint odor.

WLN: QY

STRUCTURE:



$$CH_3-\underset{\displaystyle OH}{\underset{|}{C}}HCH_3$$

PROPERTIES:

Molecular wt: 60.09; bp: 82.4; mp: -88.5; d: 0.7851; vap. d: 2.07; vap. press.: 33 mm at 20° C; miscible in all proportions with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The odor threshold level for 2-propanol is approximately 90 mg/m^3 (refs. 1,2). 2-Propanol is permitted in food for human consumption (ref. 3).

The ambient air concentration in industrial areas is reported as 153 ppm (ref. 4). This is equivalent to 375 mg/m^3.

Acetone has been identified as a human metabolite of 2-propanol (ref. 2).

It has been detected in trace quantities in samples of drinking water in the U.S. Also, in tar water from the distillation of shale tar (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

2-Propanol acts as a local irritant and in high concentration as a narcotic. It can cause eye irritation, corneal burns, and other eye damage. It is not considered an important toxic hazard (refs. 6,3). Ingestion of large quantities can cause flushing, headache, dizziness, mental depression, nausea, vomiting, narcosis, anesthesia, and coma (ref. 7). Ingestion of 2,371 mg/kg caused death in a human; a concentration of 400 ppm caused irritative effects (ref. 8). The disappearance rate of 2-propanol in blood is half that of ethanol but 5 times that of methanol (ref. 6).

LD_{50} (oral, rat): 5,340 mg/kg. (ref. 8)

There is no evidence that isopropyl alcohol is a carcinogen (ref. 5).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 980 mg/m^3 (400 ppm).

2-Propanol is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure, time-weighted average, is 400 ppm with a ceiling value of 800 ppm (ref. 2).

U.S. Food and Drug Adminsitration Requirements: residue after its use as an extractant may not exceed 50 mg/kg in spice oleoresins, 6 mg/kg in lemon oil, 2% by weight in hops (ref. 5).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 9.8×10^5 $\mu g/m^3$ (400 ppm)

Water, Health: $15 \times 9.8 \times 10^5 = 1.5 \times 10^7$ $\mu g/l$

Land, Health: $0.2 \times 1.5 \times 10^7 = 3.0 \times 10^6$ $\mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/l$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2,000$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 980/420 = 2,300$ $\mu g/m^3$

$EPC_{AH1a} = 400/420 = 0.95$ ppm

$EPC_{WH1} = 15 \times 2,300 = 34,500$ $\mu g/l$

$EPC_{WH2} = 13.8 \times 980 = 13,500$ $\mu g/l$

$EPC_{LH} = 0.2 \times 13,500 = 2,700$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/l$

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

05B020
2-PROPANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, µg/m^3 (ppm Vol)			9.8E5 (400)		2,300 (0.95)		375,000+
Water, µg/l (ppm Wt)			1.5E7	1.0E4	13,500	5,000	
Land, µg/g (ppm Wt)			3.0E6	2.0E3	2,700	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m^3 (ppm Vol)			2,300 (0.95)		
Water, µg/l (ppm Wt)			13,500	5,000	
Land, µg/g (ppm Wt)			2,700	1,000	

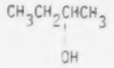
+Value is reported for industrial areas. No rural concentration is reported.

CATEGORY: 5B

WLN: QY2

2-BUTANOL: $C_4H_{10}O$ (sec-butyl alcohol).
A colorless, volatile liquid; wine-like odor. 058040

STRUCTURE:



$$CH_3CH_2\underset{\displaystyle OH}{\underset{|}{C}}HCH_3$$

PROPERTIES:

Molecular wt: 74.12; bp: 99.5; mp: -89; d: 0.8084;
vap. press.: 10 mm (20° C); vap. d: 2.55; soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Indications are that 2-butanol is less toxic than n-butanol, although little information is available. The TLV is established to prevent narcotic and irritative effects (ref. 6).

LD_{50} (oral, rat): 4,400 mg/kg (ref. 6).
LD_{Lo} (inhalation, rat): 16,000 ppm/4 hr.
Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 450 mg/m^3 (150 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $4.5 \times 10^5\ \mu g/m^3$ (150 ppm)
Water Health: $15 \times 4.5 \times 10^5 = 6.75 \times 10^6\ \mu g/l$
Land, Health: $0.2 \times 6.75 \times 10^6 = 1.35 \times 10^6\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5\ \mu g/l$
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 450/420 = 1{,}070\ \mu g/m^3$
$EPC_{AH1a} = 150/420$ ppm = 0.4 ppm
$EPC_{WH1} = 15 \times 1{,}070 = 16{,}000\ \mu g/l$
$EPC_{WH2} = 13.8 \times 450 = 6{,}200\ \mu g/l$
$EPC_{LH} = 0.2 \times 6.200 = 1.240\ \mu g/g$

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000\ \mu g/l$

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

05B040
2-BUTANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.5E5 (150)		1,070 (0.4)		
Water, $\mu g/l$ (ppm Wt)			6.8E6	1.0E5	6,200	50,000	
Land, $\mu g/g$ (ppm Wt)			1.4E6	2.0E4	1,240	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,070 (0.4)		
Water, $\mu g/l$ (ppm Wt)			6,200	50,000	
Land, $\mu g/g$ (ppm Wt)			1,240	10,000	

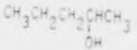
CATEGORY: 5B

WLN **STRUCTURE:**

PENTANOLS, (secondary): $C_5H_{12}O$ (amyl alcohols). 05B060

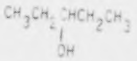
Liquid, characteristic odor.
2-PENTANOL (methyl propyl carbinol, sec amyl alcohol). 05B061
3-PENTANOL (diethyl carbinol). 05B062
3-METHYL-2-BUTANOL (sec-isoamyl alcohol, isopropyl methyl carbinol). 05B063

QY3/

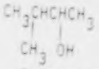

$CH_3CH_2CH_2CH(OH)CH_3$

2-Pentanol

QY2&2/


$CH_3CH_2CH(OH)CH_2CH_3$

3-Pentanol


$CH_3CH(CH_3)CH(OH)CH_3$

3-Methyl-2-butanol

PROPERTIES:

	molecular wt.	bp	d	solubility in water	vap d
2-pentanol	88.15	119.3	0.8098^{20}_{4}	slightly	3.03
3-pentanol	88.15	115.6	$.815^{25}_{4}$	slightly	3.04
3-methyl-2-butanol	88.15	113	$.819^{20}$	slightly	3.04

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Pentanols are present in fusel oil. Pentanols are obtained by fractionation of fusel oil and from pentane by chlorination and hydrolysis (ref. 9).

Amyl alcohols are used in the manufacture of lacquers, chemicals, rubber, fruit essences, and explosives (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

2-Pentanol irritates eyes and mucous membranes; can cause giddiness, headache, coughing, nausea, deafness, delerium, methemoglobinuria, and glycosuria (ref. 1). Pentanols can cause throat irritation at 100 ppm (ref. 6).

	LD_{50} [oral, rat]
2-pentanol	1,470 mg/kg
3-pentanol	1,870 mg/kg
3-methyl-2-butanol	no details available

Inhalation of amyl alcohol vapors can cause death in humans (ref. 9). Toxicity to man is considerably greater than ethanol.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 360 mg/m^3 (100 ppm for isoamyl alcohol, a primary pentanol).

(The TLV for isoamyl alcohol is a reasonable limit for the secondary pentanols as well. The LD_{50} [oral, rat] for isoamyl alcohol is 1,300 mg/kg.)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.6×10^5 μg/m^3 (100 ppm)
Water, Health: $15 \times 3.6 \times 10^5 = 5.4 \times 10^6$ μg/l
Land, Health: $0.2 \times 5.4 \times 10^6 = 1.1 \times 10^6$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 360/420 = 860$ μg/m^3
$EPC_{AH1a} = 100/420 = 0.24$ ppm
$EPC_{WH1} = 15 \times 860 = 12,900$ μg/l
$EPC_{WH2} = 13.8 \times 360 = 5,000$ μg/l
$EPC_{LH} = 0.2 \times 5,000 = 1,000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05B060

PENTANOLS (secondary)

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.6E5 (100)		860 (0.24)		
Water, μg/l (ppm Wt)			5.4E6		5,000		
Land, μg/g (ppm Wt)			1.1E6		1,000		

*To be multiplied by dilution factor

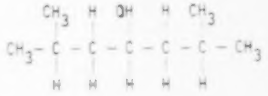
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			860 (0.24)		
Water, μg/l (ppm Wt)			5,000		
Land, μg/g (ppm Wt)			1,000		

CATEGORY: 5B

WLN: 1Y & 1YQ1Y

2,6-DIMETHYL-4-HEPTANOL: $C_9H_{20}O$ (nonyl alcohol, diisobutyl carbinol, 2,6-dimethyl heptan-4-ol).058080
A colorless liquid.

STRUCTURE:



$$CH_3-\underset{H}{\overset{CH_3}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{OH}{C}}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{CH_3}{C}}-CH_3$$

PROPERTIES:
Molecular wt: 144.26; bp: $176-7^{760}$; d: 0.809_4^{21}; vap.d: 4.98; vap. press: 0.3 mm at 20°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2,6-Dimethyl-4-heptanol is used as a reaction medium in a process for the manufacture of hydrogen peroxide. It is also used as a solvent for coating compositions of urea or melamine resins, as a defoaming agent, and for the preparation of lubricant additives and plasticizers (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

In animal studies with the rat and rabbit, 2,6-dimethyl-4-heptanol rich in trimethyl hexanol resulted in degeneration in brain neurons, hepatocellular degeneration, and renal damage (ref. 9).

LD_{50} (oral, rat): 3,560 mg/kg (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 3,560 = 1.60 \times 10^5$ µg/m^3	Air, Ecology:
Water, Health: $15 \times 1.6 \times 10^5 = 2.4 \times 10^6$ µg/l	Water, Ecology:
Land, Health: $0.2 \times 2.4 \times 10^6 = 4.8 \times 10^5$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 3,560 = 380.9$ µg/m^3

$EPC_{AH3} = 0.081 \times 3,560 = 288.4$ µg/m^3

$EPC_{WH1} = 15 \times 288.4 = 4,326$ µg/l

$EPC_{WH2} = 0.4 \times 3,560 = 1,424$ µg/l

$EPC_{LH} = 0.2 \times 1,424 = 285$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05B080
2,6-DIMETHYL-4-HEPTANOL

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.6E5		288		
Water, $\mu g/l$ (ppm Wt)			2.4E6		1,424		
Land, $\mu g/g$ (ppm Wt)			4.8E5		285		

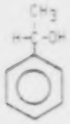
*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. *Zero* Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			288		
Water, $\mu g/l$ (ppm Wt)			1,424		
Land, $\mu g/g$ (ppm Wt)			285		

CATEGORY: 5B

WLN: QYR

STRUCTURE:



1-PHENYLETHANOL: $C_8H_{10}O$ (methylphenylcarbinol, α-methyl-α-hydroxy toluene, α-phenethyl alcohol, α-methylbenzyl alcohol). 05B100

PROPERTIES:

Molecular wt: 122.18; bp: 203; fp: 21.4; d: 1.0129; vap. press.: 0.1 mm at 20°; vap. d: 4.21.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

No information is available concerning the toxic effects of 1-phenylethanol. LD_{50} (oral, rat): 400 mg/kg. (ref. 8)

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 400 = 1.8 \times 10^4$ μg/m^3
Water, Health: $15 \times 1.8 \times 10^4 = 2.7 \times 10^5$ μg/l
Land, Health: $0.2 \times 2.7 \times 10^5 = 5.4 \times 10^4$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 400 = 43$ μg/m^3
$EPC_{AH3} = 0.081 \times 400 = 32$ μg/m^3
$EPC_{WH1} = 15 \times 32 = 480$ μg/l
$EPC_{WH2} = 0.4 \times 400 = 160$ μg/
$EPC_{LH} = 0.2 \times 160 = 32$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05B100
1-PHENYLETHANOL

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.8E4		32		
Water, $\mu g/l$ (ppm Wt)			2.7E5		160		
Land, $\mu g/g$ (ppm Wt)			5.4E4		32		

*To be multiplied by dilution factor

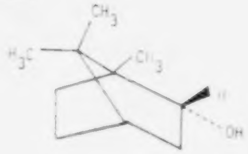
AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			32		
Water, $\mu g/l$ (ppm Wt)			160		
Land, $\mu g/g$ (ppm Wt)			32		

CATEGORY: 5B

BORNEOL: $C_{10}H_{18}O$ (endo-2-bornanol, endo-1,7,7-trimethyl bicyclo [2.2.1]heptan-2-ol; endo-2-camphanol, endo-2-hydroxy camphane, bornyl alcohol, borneo camphor) 058120

WLN: L55 ATJ AA B CQ

STRUCTURE:



d-Borneol

A colorless crystal with a peppery odor and a burning taste.

PROPERTIES:

Molecular wt: 154.25; mp: 208.6; bp: 215; d: 1.011_4^{20}; vap.d: 5.31; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Dextrorotatory borneol occurs in oil from plants, for example, Dryobalanops aromatica; levorotatory form is found in plants, for example, Blumea balsamifera (ref. 7).

Racemic borneol is formed by the reduction of camphor (ref. 7).

Borneol has been found in samples taken from finished drinking water twice, and in freshwater river samples three times (ref. 10).

Borneol is used primarily in the manufacture of its esters; also in perfumery and incense production (ref. 7).

TOXIC PROPERTIES, HEALTH EFFECTS:

Borneol may cause nausea, vomiting, mental confusion, dizziness, and convulsions (ref. 7).

LD_{Lo} (oral, rabbit): 2,000 mg/kg (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 2000 = 9.0 \times 10^4$ μg/m^3	Air, Ecology:	
Water, Health:	$15 \times 9.0 \times 10^4 = 1.35 \times 10^6$ μg/l	Water, Ecology:	
Land, Health:	$0.2 \times 1.35 \times 10^6 = 2.7 \times 10^5$ μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 2,000 = 214$ μg/m^3

$EPC_{AH3} = 0.081 \times 2,000 = 162$ μg/m^3

$EPC_{WH1} = 15 \times 162 = 2430$ μg/l

$EPC_{WH2} = 0.4 \times 2000 = 800$ μg/ℓ

$EPC_{LH} = 0.2 \times 800 = 160$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05B120
BORNEOL

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			9.0E4		162		
Water, $\mu g/l$ (ppm Wt)			1.4E6		800		
Land, $\mu g/g$ (ppm Wt)			2.7E5		160		

*To be multiplied by dilution factor

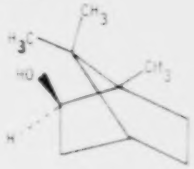
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			162		
Water, $\mu g/l$ (ppm Wt)			800		
Land, $\mu g/g$ (ppm Wt)			160		

CATEGORY: 5B

ISOBORNEOL: $C_{10}H_{18}O$ (α,β-camphol, exo-1,7,7-trimethylbicyclo-[2.2.1]heptan-2-ol, exo-2-bornanol, exo-2-camphanol).
A white solid with a camphor odor. 058140

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 154.26; mp: 212; bp: sublimes; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

No information is available regarding toxic properties of isoborneol. Because of similarities in chemical structure, it is likely to be toxicologically similar to borneol.

LD_{LO} (oral, rabbit): 2,000 mg/kg for borneol (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 2{,}000 = 9.0 \times 10^4$ μg/m³ Air, Ecology:

Water, Health: $15 \times 9.0 \times 10^4 = 1.35 \times 10^6$ μg/l Water, Ecology:

Land, Health: $0.2 \times 1.35 \times 10^6 = 2.7 \times 10^5$ μg/g Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 2{,}000 = 214$ μg/m³

$EPC_{AH3} = 0.081 \times 2{,}000 = 162$ μg/m³

$EPC_{WH1} = 15 \times 162 = 2{,}430$ μg/l

$EPC_{WH2} = 0.4 \times 2{,}000 = 800$ μg/l

$EPC_{LH} = 0.2 \times 800 = 160$ μg/g

Based on LD_{LO} for borneol.

05B140
ISOBORNEOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			9.0E4		162		
Water, $\mu g/l$ (ppm Wt)			1.4E6		800		
Land, $\mu g/g$ (ppm Wt)			2.7E5		160		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			162		
Water, $\mu g/l$ (ppm Wt)			800		
Land, $\mu g/g$ (ppm Wt)			160		

REFERENCES: CATEGORY 5B

Alcohols - Secondary Alcohols

1. Bond, R. G., Straub, C. P., Prober R., Eds. Handbook of Experimental Control. Vol. 1: Air Pollution. The Chemical Rubber Co., Cleveland, OH (1972).
2. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Isopropyl Alcohol. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC. HEW Publication No. (NIOSH)76-142 (1976).
3. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).
4. Wagoner, D. Compilation of Ambient Trace Substances. Draft of Report Prepared by Research Triangle Institute under Contract No. 68-02-1325 for U.S. Environmental Protection Agency. Available from Tucker, W. G., Project Officer, IERL-EPA, Research Triangle Park, NC (1976).
5. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 15, Lyon, France. A World Health Organization Publication (WHO), Geneva (1977).
6. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).
7. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).
8. Christensen, H. E., Fairchild, E. J. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH)76-191 (1976).
9. Treon, J. F. Alcohols. In: Patty, F. A., Ed., Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2 Interscience Publishers, New York, NY (1963).
10. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

CATEGORY 5

ALCOHOLS

SUBCATEGORY: 5C - Tertiary Alcohols

Summary of Subcategory

Total number of compounds in subcategory	3
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

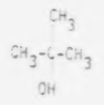
CATEGORY: 5C

t-BUTYL ALCOHOL: $C_4H_{10}O$ (2-methyl-2-propanol, t-butanol, trimethyl carbinol). 05C020

A colorless liquid, or rhombic prisms or planes; camphor-like odor.

WLN: QX

STRUCTURE:



$$CH_3-\overset{\overset{\large CH_3}{|}}{\underset{\underset{\large OH}{|}}{C}}-CH_3$$

PROPERTIES:

Molecular wt: 74.12; mp: 25.3; bp: 82.8; d: 0.789; vap. press.: 40 mm at 24.5°; vap. d: 2.55; miscible in all proportions with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

t-Butyl alcohol has been identified in public water supply samples in concentration of 0.01 μg/ℓ (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Butyl alcohols are not considered serious toxic hazards (ref. 2), but may be irritating to skin (ref. 3).
It has a stronger narcotic effect on mice than n-butanol or isobutyl alcohol (ref. 3).
Effects of long term continuous dosage were not injurous in animals tested (ref. 2)
LD_{50} (oral, rat): 3,500 mg/kg (ref. 4).
Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 300 mg/m^3 (100 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.00×10^5 μg/m^3 (100 ppm)
Water, Health: $15 \times 3.0 \times 10^5 = 4.5 \times 10^6$ μg/l
Land, Health: $0.2 \times 4.5 \times 10^6 = 9 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 300/420 = 710$ μg/m^3
$EPC_{AH1a} = 100/420 = 0.24$ ppm
$EPC_{WH1} = 15 \times 710 - 10{,}700$ μg/l
$EPC_{WH2} = 13.8 \times 300 = 4{,}140$ μg/l
$EPC_{LH} = 0.2 \times 4{,}140 = 828$ μg/g

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ μg/l

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05C020
t-BUTYL ALCOHOL

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.0E5 (100)		710 (0.24)		
Water, μg/l (ppm Wt)			4.5E6	1.0E5	4,140	50,000	0.01+
Land, μg/g (ppm Wt)			9.0E5	2.0E4	830	10,000	

*To be multiplied by dilution factor

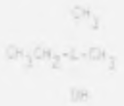
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			710 (0.24)		
Water, μg/l (ppm Wt)			4,140	50,000	
Land, μg/g (ppm Wt)			830	10,000	

+Public water supply.

CATEGORY: 5C

WLN: QX2

STRUCTURE:



$$CH_3CH_2-\overset{CH_3}{\underset{OH}{C}}-CH_3$$

t-PENTANOL: $C_5H_{12}O$ (t-pentyl alcohol, t-amyl alcohol, 2-methyl-2-butanol, dimethyl ethyl carbinol). (t indicates tertiary.) 05C040

Volatile liquid; characteristic odor, burning taste.

PROPERTIES:

Molecular wt: 88.15; bp: 102; mp: -8.4; vap. press.: 10 mm at 17.2°; vap. d: 3.03; d: 0.8059; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Amyl alcohols are present in fusel oil.

TOXIC PROPERTIES, HEALTH EFFECTS:

t-Pentanol is reported to be moderately irritating to mucous membranes and narcotic in high concentrations (ref. 6). Based on animal studies, the toxicity appears to be about three times that of the primary pentanols.

LD_{50} (oral, rat): 1,000 mg/kg.

Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1{,}000 = 4.5 \times 10^4$ μg/m^3

Water, Health: $15 \times 4.5 \times 10^4 = 6.8 \times 10^5$ μg/l

Land, Health: $0.2 \times 6.8 \times 10^5 = 1.4 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}000 = 107$ μg/m^3

$EPC_{AH3} = 0.081 \times 1{,}000 = 81$ μg/m^3

$EPC_{WH1} = 15 \times 81 = 1{,}220$ μg/l

$EPC_{WH2} = 0.4 \times 1{,}000 = 400$ μg/l

$EPC_{LH} = 0.2 \times 400 = 80$ μg/g

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ μg/l

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05C040
t-PENTANOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.5E4		81		
Water, $\mu g/l$ (ppm Wt)			6.8E5	1.0E5	400	50,000	
Land, $\mu g/g$ (ppm Wt)			1.4E5	2.0E4	80	10,000	

*To be multiplied by dilution factor

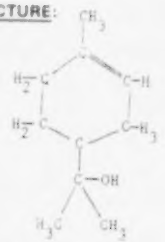
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			81		
Water, $\mu g/l$ (ppm Wt)			400	50,000	
Land, $\mu g/g$ (ppm Wt)			80	10,000	

CATEGORY: 5C

α-TERPINEOL: $C_{10}H_{18}O$ (α,α,4-trimethyl-3-cyclohexene-1-methanol, p-menth-1-en-8-ol). C5C060
A colorless crystal.

WLN:

STRUCTURE:



PROPERTIES:
Molecular wt: 154.25; mp: 38-40; bp: 219-21; d: 0.935^{15}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

α-Terpineol has been found in samples taken from finished drinking water at 0.5 μg/l (ref. 1). It has also been found in freshwater river samples three times (ref. 5).

α-Terpineol is used in perfumes and in denaturing fats for soap manufacture (ref. 6).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 4,300 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 4{,}300 = 1.94 \times 10^5$ μg/m^3
Water, Health: $15 \times 1.94 \times 10^5 = 2.90 \times 10^6$ μg/l
Land, Health: $0.2 \times 2.90 \times 10^6 = 5.8 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 4{,}300 = 460$ μg/m^3
$EPC_{AH3} = 0.081 \times 4{,}300 = 348$ μg/m^3
$EPC_{WH1} = 15 \times 348 = 5{,}220$ μg/l
$EPC_{WH2} = 0.4 \times 4{,}300 = 1{,}720$ μg/l
$EPC_{LH} = 0.2 \times 1{,}720 = 344$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

05C060
α-TERPINEOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.9E5		348		
Water, $\mu g/l$ (ppm Wt)			2.9E6		1,720		
Land, $\mu g/g$ (ppm Wt)			5.8E5		344		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			348		
Water, $\mu g/l$ (ppm Wt)			1,720		
Land, $\mu g/g$ (ppm Wt)			344		

REFERENCES: CATEGORY 5C

Alcohols - Tertiary Alcohols

1. U.S. Environmental Protection Agency, Office of Toxic Substances. Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress. Environmental Protection Agency, Washington, DC (1975).
2. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1976).
3. Treon, J. F. Alcohols. In: Patty, F. A., Ed., Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2 Interscience Publishers, New York, NY (1963).
4. Christensen, H. E., Fairchild, E. J. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH)76-191 (1976).
5. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.
6. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

CATEGORY 6

GLYCOLS, EPOXIDES

SUBCATEGORY: 6A - Glycols

Summary of Subcategory

Total number of compounds in subcategory	2
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

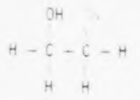
Consent Decree compounds included in subcategory: None

CATEGORY: 6A

WLN: Q2Q

ETHYLENE GLYCOL: $C_2H_6O_2$ (1,2-dihydroxyethane, 1,2-ethanediol).
Ethylene glycol is an odorless, colorless, viscous, poisonous liquid with a sweet taste. 06A020

STRUCTURE:



$$\begin{array}{ccccccc} & & OH & & OH & & \\ & & | & & | & & \\ H & - & C & - & C & - & H \\ & & | & & | & & \\ & & H & & H & & \end{array}$$

PROPERTIES:

Molecular wt: 62.06; mp: -11.5; bp: 198; d: 1.1088; vap. press.: 13 mm at 93°; vap. d: 2.14; completely miscible with water; hygroscopic.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethylene glycol may be formed by the acid hydrolysis of ethylene oxide. The low vapor pressure precludes exposure to vapors at room temperature (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Ingestion of 1,500 mg/kg has resulted in human death (ref. 2). When ingested, it causes central nervous system effects and kidney injury (ref. 3). Exposure to concentrations greater than 140 mg/m^3 is reported to cause irritation and other effects (ref. 1).

LD_{50} (oral, rat): 5,840 mg/kg.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 2).

Animal testing of ethylene glycol indicates that it is not a carcinogenic chemical (ref. 8).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 10 mg/m^3 (particulate).

TLV = 260 mg/m^3 (100 ppm) (vapor).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.0×10^4 $\mu g/m^3$
Water, Health: $15 \times 1.0 \times 10^4 = 1.5 \times 10^5$ $\mu g/\ell$
Land, Health: $0.2 \times 1.5 \times 10^5 = 3.0 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 10/420 = 24$ $\mu g/m^3$
$EPC_{WH1} = 15 \times 24 = 360$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 10 = 140$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 140 = 30$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

06A020
ETHYLENE GLYCOL

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E4		24		
Water, $\mu g/l$ (ppm Wt)			1.5E5	1.0E4	140	5,000	
Land, $\mu g/g$ (ppm Wt)			3.0E4	2.0E3	30	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

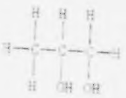
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			24		
Water, $\mu g/l$ (ppm Wt)			140	5,000	
Land, $\mu g/g$ (ppm Wt)			30	1,000	

CATEGORY: 6A

PROPYLENE GLYCOL: $C_3H_8O_2$ (1,2-propanediol, methyl glycol, 1,2-dihydroxypropane, methylethylene glycol). 06A040
A colorless, odorless, hygroscopic liquid.

WLN: QY1Q

STRUCTURE:



PROPERTIES:

Molecular wt: 76.11; bp: 189; d: 1.0361^{20}_{4}; vap. d: 2.62; vap. press: 0.08 mm at 20°, soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Propylene glycol can be produced by heating glycerol with NaOH (ref. 4). It is used as a nontoxic antifreeze in breweries and dairy establishments, as a solvent for pharmaceuticals, as a mist to disinfect air, and as a substitute for ethylene glycol and glycerol (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

Health hazards in industrial handling are negligible (ref. 5). Taken internally it is harmless, probably because its oxidation yields pyruvic and acetic acids (ref. 4).

A closely related compound, 1,3-propanediol caused teratogenic effects (micromelia) when 0.05 ml was injected into the chick air or yolk sac on the 4th day (ref. 6). Propylene glycol was reported to be moderately lethal when injected into the chick air cell on the 4th day (ref. 6).

Evidence for carcinogenicity is considered unreliable (ref. 7). Although bladder tumors were produced in rodents on oral administration, tumors occurred only at high propylene glycol dosages, and were accompanied by formation of calcium oxalate stones, thereby precluding a conclusion of carcinogenicity (ref. 7).

LD_{50} (oral, rat): 21 g/kg (ref. 2).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 21{,}000 = 9.45 \times 10^5$ µg/m³

Water, Health: $15 \times 9.45 \times 10^5 = 1.42 \times 10^7$ µg/l

Land, Health: $0.2 \times 1.42 \times 10^7 = 2.8 \times 10^6$ µg/g

Air, Ecology:

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ µg/l

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2 \times 10^4$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 21{,}000 = 2{,}247$ µg/m³

$EPC_{AH3} = 0.081 \times 21{,}000 = 1{,}700$ µg/m³

$EPC_{WH1} = 15 \times 1{,}700 = 25{,}500$ µg/l

$EPC_{WH2} = 0.4 \times 21{,}000 = 8{,}400$ µg/l

$EPC_{LH} = 0.2 \times 8{,}400 = 1{,}680$ µg/g

$EPC_{WE1} = 50 \times >1{,}000 = >5.0 \times 10^4$ µg/l

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 10{,}000$ µg/g

06A040
PROPYLENE GLYCOL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			9.5E5		1,700		
Water, $\mu g/l$ (ppm Wt)			1.4E7	1.0E5	8,400	50,000	
Land, $\mu g/g$ (ppm Wt)			2.8E6	2.0E4	1,680	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,700		
Water, $\mu g/l$ (ppm Wt)			8,400	50,000	
Land, $\mu g/g$ (ppm Wt)			1,680	10,000	

REFERENCES: CATEGORY 6A

Glycols, Epoxides - Glycols

1. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

2. Christensen, H.E., and F.J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD. for National Institute for Occupational Safety and Health. Hew Publication No. (NIOSH) 76-191 (1976).

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4. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

5. Rowe, V.K. Glycols. In: F. A. Patty Ed., Industrial Hygiene and Toxicology, Revised Edition, Vol.2, Interscience Publishers, New York, NY (1963).

6. Shepard, T.H. Catalog of Teratogenic Agents. John Hopkins University Press, Baltimore, MD (1973).

7. Grasso, P., and C. O'Hare. Carcinogens in Food. Chemical Carcinogens. C. E. Searle, Ed., American Chemical Society, Washington, DC (1976).

8. Mason Research Institute. Toxicology and Carcinogenesis of Various Chemicals Used in the Preparation of Vaccines. DHEW Contract No. PH-43-67-673. Mason Research Institute, Worcester, MA (1969).

CATEGORY 6

GLYCOLS, EPOXIDES

SUBCATEGORY: 6B - Epoxides

Summary of Subcategory

Total number of compounds in subcategory	1
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

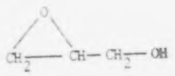
CATEGORY: 6B

2,3-EPOXY-1-PROPANOL: $C_3H_6O_2$ (glycidol, 3-hydroxypropylene oxide, epihydrin alcohol, glycidyl alcohol, 3-hydroxy-1,2-epoxypropane). 06B020

A colorless liquid.

WLN: T3OTJ B1Q

STRUCTURE:



PROPERTIES:

Molecular wt: 74.08; bp: 160; d: 1.165_{0}^{0}; vap. d: 2.15; vap. press: 0.9 mm Hg at 25°, soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2,3-Epoxy-1-propanol is used in the preparation of glycerol and glyceride ethers, esters, amines, in the pharmaceutical industry, and in sanitary chemicals. It can be detected by the pyridinium chloride-chloroform method (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

There are no observed effects reported in man.

Animal studies indicate that slight toxicity is produced after ingestion or percutaneous absorption. Toxicity is moderate following inhalation. It is moderately irritating to surface tissue. It is a stimulant and depressant of the CNS (ref. 1). A level of 400 ppm for 7 days, for a 50-day period, gave no evidence of systemic toxicity to animals (ref. 2).

LD_{50} (oral, rat): 850 mg/kg (ref. 3).

LC_{50} (inhalation, rat): 580 ppm/8 hrs (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 150 mg/m^3 (50 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	1.5×10^5 μg/m^3 (50 ppm)	Air, Ecology:
Water, Health:	$15 \times 1.5 \times 10^5 = 2.25 \times 10^6$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 2.25 \times 10^6 = 4.5 \times 10^5$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 150/420 = 357$ μg/m^3

$EPC_{AH1a} = 50/420 = 0.12$ ppm

$EPC_{WH1} = 15 \times 357 = 5,355$ μg/l

$EPC_{WH2} = 13.8 \times 150 = 2,070$ μg/l

$EPC_{LH} = 0.2 \times 2,070 = 414$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

06B020
2,3-EPOXY-1-PROPANOL

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.5E5 (50)		357 (0.12)		
Water, $\mu g/l$ (ppm Wt)			2.3E6		2,070		
Land, $\mu g/g$ (ppm Wt)			4.5E5		414		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			357 (0.12)		
Water, $\mu g/l$ (ppm Wt)			2,070		
Land, $\mu g/g$ (ppm Wt)			414		

REFERENCES: CATEGORY 6B

Glycols, Epoxides - Epoxides

1. Hine, C. H., and V. K. Rowe. Epoxy Compounds. Industrial Hygiene and Toxicology, Second Edition, Vol. 2. F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

2. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

3. Christensen, H. E. and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

CATEGORY 7

ALDEHYDES, KETONES

SUBCATEGORY: 7A - Aldehydes

Summary of Subcategory

Total number of compounds in subcategory	8
number of parent compounds with subspecies	1
number of subspecies	2
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: 1

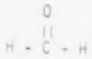
07A060 Acrolein

CATEGORY: 7A

FORMALDEHYDE: CH_2O (methanal, methyl aldehyde, methylene oxide). 07A020.
A colorless gas with a pungent, suffocating odor.

WLN: VHH

STRUCTURE:



$$H-\overset{\overset{\displaystyle O}{\|}}{C}-H$$

PROPERTIES:

Molecular wt.: 30.03; mp: -92; bp: -21; d: 0.815; vap. d: 1.067; very soluble; vap. press.: 10 mm at -88°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formaldehyde is the simplest aldehyde. It is catalytically reduced to methanol or oxidized to formic acid. A 37-percent formaldehyde solution is called formalin.

There is some evidence that formaldehyde is a natural constituent of the atmosphere at a few parts per billion (ref. 1). Odor recognition level is 0.060 to 1.20 mg/m^3 (ref. 2). Photooxidation of formaldehyde is reported as 51 percent in 5 hours for an initial concentration of 15 ppm (ref. 2). Formaldehyde is emitted to the atmosphere in gasoline and diesel exhaust, from coal combustion, fuel-oil combustion, and from wood burning (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Formaldehyde is an irritant to eyes, mucous membranes, and respiratory tract. Eye irritation is experienced by some persons at concentrations of 0.1 ppm (ref. 1). Concentrations as low as 0.3 to 2.7 ppm cause irritation in humans exemplified by annoying odor, prickling irritation of mucous membranes, and disturbed sleep (ref. 3). The lowest lethal oral dose to a human is 36 mg/kg (ref. 4).

LD_{50} (oral, rat): 800 mg/kg.

LC_{Lo} (inhalation, rat): 250 ppm for 4 hours.

Formaldehyde is reported to produce tumors in rats. The EPA/NIOSH ordering numer is 4101; lowest dosage to produce an oncogenic response is 96 mg/kg; adjusted ordering number: 42.7.

Exposure to <0.2 ppm for two days caused plant leaf symptoms and necrosis in petunia (ref. 2). This is equivalent to 0.247 mg/m^3. A concentration of 95 mg/ℓ in water can cause tainting of fish flesh (ref. 5).

Aquatic toxicity: TLm 96 = 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 3 mg/m^3 (2 ppm).

On First Priority Chemicals List of the Chemical Industry Institute of Toxicology (ref. 6).

Formaldehyde is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 1.2 mg/m^3 (1ppm) as a 20-minute ceiling (ref. 14).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.2×10^3 µg/m^3
Water, Health: $15 \times 1.2 \times 10^3 = 1.8 \times 10^4$ µg/ℓ
Land, Health:

Air, Ecology: $247 \times 2 = 494$ µg/m^3
Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ µg/ℓ
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1.2/420 = 2.9$ µg/m^3
$EPC_{AH1a} = 1/420 = 0.002$ ppm
$EPC_{WH1} = 15 \times 2.9 = 43.5$ µg/ℓ
$EPC_{WH2} = 13.8 \times 1.2 = 16.6$ µg/ℓ

$EPC_{AC2} = 10^3/(6 \times 42.7) = 3.9$ µg/m^3
$EPC_{WC} = 15 \times 3.9 = 58.5$ µg/ℓ

$EPC_{AE} = 100 \times 0.247 \times 2 = 49$ µg/m^3

$EPC_{WE1} = 50 \times 10 = 500$ µg/ℓ
$EPC_{WE2} = 95{,}000$ µg/ℓ (to prevent tainting)

MULTIMEDIA ENVIRONMENTAL GOALS

X

07A020
FORMALDEHYDE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.2E3	5.0E2	3	49	~3
Water, $\mu g/l$ (ppm Wt)			1.8E4	1.0E3	17	500	
Land, $\mu g/g$ (ppm Wt)			3.6E3	2.0E2	3	100	

*To be multiplied by dilution factor

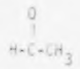
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			3 (0.002)	49	3.9
Water, $\mu g/l$ (ppm Wt)			17	500	58.5
Land, $\mu g/g$ (ppm Wt)			3	100	12

CATEGORY: 7A

WLN: VH1

ACETALDEHYDE: C_2H_4O (acetic aldehyde, ethanal, ethyl aldehyde). A colorless, fuming liquid; pungent, fruity odor. 07A040.

STRUCTURE:



$H\text{-}\overset{\overset{O}{|}}{C}\text{-}CH_3$

PROPERTIES:

Molecular wt.: 44.05; mp: -121; bp: 20.8; d: 0.780-0.790 g/ml; vap. press.: 760 mm at 20.2°; vap. d: 1.52; soluble in all proportions in hot water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Aldehydes can be catalytically reduced to alcohols.

Rural concentration in air is reported as 0.3 ppb (ref. 7). This is equivalent to 0.0003 ppm or 0.530 $\mu g/m^3$. Odor recognition range is 130 to 412 $\mu g/m^3$ (ref. 2). Photooxidation of acetaldehyde is reported as 12 percent in five hours for initial concentration of 5 ppm (ref. 2).

Acetaldehyde has been found in samples of public drinking water supplies at concentrations of 0.1 $\mu g/\ell$ (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Acetaldehyde is an eye and respiratory system irritant and a central nervous system narcotic (refs. 3,9).

The ACGIH TLV is substantially higher than the USSR limit of 3 ppm (ref. 3). A concentration of 50 ppm causes irritative effects in humans (ref. 3).

LD_{50} (oral, rat): 1,930 mg/kg.

LC_{Lo} (inhalation, rat): 4,000 ppm for 4 hours.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 180 mg/m^3 (100 ppm). (Recommended to prevent excessive eye irritation and potential injury to the respiratory tract.)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.8×10^5 $\mu g/m^3$ (100 ppm)

Water, Health: $15 \times 1.8 \times 10^5 = 2.7 \times 10^6$ $\mu g/\ell$

Land, Health: $0.2 \times 2.7 \times 10^6 = 5.4 \times 10^5$ $\mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 180/420 = 430$ $\mu g/m^3$

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 430 = 6{,}450$ $\mu g/\ell$

$EPC_{WH2} = 13.8 \times 180 = 2{,}480$ $\mu g/\ell$

$EPC_{LH} = 0.2 \times 2{,}480 = 500$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

07A040
ACETALDEHYDE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.8E5 (100)		430 (0.24)		0.53
Water, $\mu g/l$ (ppm Wt)			2.7E6		2,480		0.1†
Land, $\mu g/g$ (ppm Wt)			5.4E5		500		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			430 (0.24)		
Water, $\mu g/l$ (ppm Wt)			2,480		
Land, $\mu g/g$ (ppm Wt)			500		

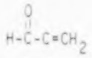
†Public drinking water supplies.

CATEGORY: 7A

ACROLEIN: C_3H_4O (acrylic aldehyde, propenal). 07A060.
A colorless or yellowish liquid; disagreeable choking odor.

WLN: VH1U1

STRUCTURE:



$$H-\overset{\overset{\displaystyle O}{\|}}{C}-C=CH_2$$

PROPERTIES:

Molecular wt: 56.06; bp: 52.5; mp: -87; vap. press.: 214 mm at 20°; vap. d: 1.94; d: .8389; very soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

An urban concentration of 0.003 ppm has been reported (ref. 7). This is equivalent to 6.9 $\mu g/m^3$. Odor recognition levels ranging from 480 to 4,500 $\mu g/m^3$ are reported (refs. 2, 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

Acrolein, because of its unsaturation, is much more toxic and irritating than the saturated aldehydes. It causes respiratory irritation in concentrations as low as 1 ppm (ref. 4). The lowest reported lethal concentration of acrolein for man is 153 ppm for 10 minutes (ref. 4). The compound causes lacrimation at 0.67 ppm after 20 seconds (ref. 1).

LD_{50} (oral, rat): 46 mg/kg.

LC_{Lo} (inhalation, rat): 8 ppm for 4 hours.

Aquatic toxicity: TLm 96: <1 ppm (ref. 4).

Toxicity to vegetation: Alfalfa sustained oxidant type damage when exposed to 250 $\mu g/m^3$ (0.1 ppm) for 9 hours (ref. 11).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.25 mg/m^3 (0.1 ppm).

Acrolein appears on EPA Consent Decree Priority III List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 250 $\mu g/m^3$ (0.1 ppm)
Water, Health: $15 \times 250 = 3.75 \times 10^3\ \mu g/\ell$
Land, Health: $0.2 \times 3.75 \times 10^3 = 750\ \mu g/g$

Air, Ecology: $250 \times 9/24 = 94\ \mu g/m^3$
Water, Ecology: $100 \times <1 = <100\ \mu g/\ell$
Land, Ecology: $0.2 \times 100 = <20\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.25/420 = 0.6\ \mu g/m^3$
$EPC_{AH1a} = 0.1/420 = 0.00024$ ppm
$EPC_{WH1} = 15 \times 0.6 = 9\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 0.25 = 3.5\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 3.5 = 0.7\ \mu g/g$

$EPC_{AE} = 0.1 \times 250 \times 9/24 = 9\ \mu g/m^3$

$EPC_{WE1} = 50 \times <1 = <50\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 50 = <10\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

07A060

ACROLEIN

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.5E2 (0.1)	9.4E1	0.6 (2.4E-4)	9	6.9†
Water, $\mu g/l$ (ppm Wt)			3.75E3	1.0E2	3.5	50	
Land, $\mu g/g$ (ppm Wt)			7.5E2	2.0E1	0.7	10	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			0.6 (2.4E-4)	9	
Water, $\mu g/l$ (ppm Wt)			3.5	50	
Land, $\mu g/g$ (ppm Wt)			0.7	10	

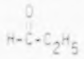
†Concentration is reported for urban atmosphere. No rural concentration is reported.

CATEGORY: 7A

WLN: VH2

PROPIONALDEHYDE: C_3H_6O (propanal, propaldehyde, propyl aldehyde). A colorless liquid; suffocating odor. 07A080.

STRUCTURE:



$$H-\overset{\overset{O}{\|}}{C}-C_2H_5$$

PROPERTIES:

Molecular wt: 58.08; bp: 48; mp: -81; d: 0.807;
vap. d: 2.0; vap. press.: 300 mm at 25°; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Rural background concentration in air is reported to be 0.5 to 3.8 ppbc (ref. 7). This is equivalent to 0.16-1.27 ppb or 0.38-3.01 $\mu g/m^3$.

Photooxidation of propionaldehyde is reported as 25 percent in 6 hours for an initial concentration of 19 ppm (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

The acute toxic properties of propionaldehyde are similar to other small aldehydes. It is a local irritant to eyes and mucous membranes and acts as a central nervous system narcotic.

LD_{Lo} (oral, rat): 800 mg/kg
LC_{Lo} (inhalation, rat): 8,000 ppm for 4 hours.
Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 800 = 3.6 \times 10^4$ $\mu g/m^3$
Water, Health: $15 \times 3.6 \times 10^4 = 5.4 \times 10^5$ $\mu g/\ell$
Land, Health: $0.2 \times 5.4 \times 10^5 = 1.1 \times 10^5$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 800 = 86$ $\mu g/m^3$
$EPC_{AH3} = 0.081 \times 800 = 65$ $\mu g/m^3$
$EPC_{WH1} = 15 \times 65 = 980$ $\mu g/\ell$
$EPC_{WH2} = 0.4 \times 800 = 320$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 320 = 60$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5{,}000$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

07A080
PROPIONALDEHYDE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E4		65		0.38 to 3.01
Water, $\mu g/l$ (ppm Wt)			5.4E5	1.0E4	320	5,000	
Land, $\mu g/g$ (ppm Wt)			1.1E5	2.0E3	60	1,000	

*To be multiplied by dilution factor

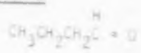
AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			65		
Water, $\mu g/l$ (ppm Wt)			320	5,000	
Land, $\mu g/g$ (ppm Wt)			60	1,000	

CATEGORY: 7A

WLN: VH3

BUTYRALDEHYDE: C_4H_8O (butanal, butric aldehyde, n-butyl aldehyde). A colorless, flammable, liquid. 07A100

STRUCTURE:



$CH_3CH_2CH_2\overset{H}{C} = O$

PROPERTIES:

Molecular wt: 72.1; mp: -100° C; bp: 74.7° C;
d: 0.802^{20}_{4}; vap. d: 2.5; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

A concentration of 580 mg/m^3 is reported to cause irritative effects in humans (ref. 4).
LD_{50} (oral, rat): 2,490 mg/kg.
Aquatic toxicity: TLm 96: 10-1 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 2,490 = 1.1 \times 10^5\ \mu g/m^3$
Water, Health: $15 \times 1.1 \times 10^5 = 1.65 \times 10^6\ \mu g/\ell$
Land, Health: $0.2 \times 1.65 \times 10^6 = 3.3 \times 10^5\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 1 = 100\ \mu g/\ell$
Land, Ecology: $0.2 \times 100 = 20\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 2,490 = 266\ \mu g/m^3$
$EPC_{AH3} = 0.081 \times 2,490 = 202\ \mu g/m^3$
$EPC_{WH1} = 15 \times 202 = 3,030\ \mu g/\ell$
$EPC_{WH2} = 0.4 \times 2,490 = 1,000\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 1,000 = 200\ \mu g/g$

$EPC_{WE1} = 50 \times 1 = 50\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 50 = 10\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

07A100
BUTYRALDEHYDE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.1E5		202		
Water, μg/l (ppm Wt)			1.65E6	1.0E2	1,000	50	
Land, μg/g (ppm Wt)			3.3E5	2.0E1	200	10	

*To be multiplied by dilution factor

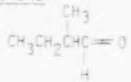
AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			202		
Water, μg/l (ppm Wt)			1,000	50	
Land, μg/g (ppm Wt)			200	10	

CATEGORY: 7A

METHYLBUTANALS: $C_5H_{10}O$ 07A120.
2-METHYLBUTANAL: $C_5H_{10}O$ (2-methylbutyraldehyde, ethylmethyl acetaldehyde, α-methylbutyraldehyde). 07A121.
3-METHYLBUTANAL: $C_5H_{10}O$ (isovaleraldehyde, 3-methylbutyraldehyde, isopentaldehyde, isovaleral, isovaleric aldehyde). 07A122.
A colorless liquid with a pungent apple-like odor.

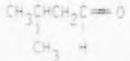
WLN/STRUCTURE:

VHY2



$CH_3CH_2\overset{CH_3}{CH}\underset{H}{C}{=}O$

2-methylbutanal



$CH_3\underset{CH_3}{CH}CH_2\underset{H}{C}{=}O$

3-methylbutanal

PROPERTIES:

	Molecular wt.	bp	mp	d	solubility	vap.d
2-methylbutanal:	86.14	$92\text{-}3^{760}$		0.8029_4^{20}	insoluble	
3-methylbutanal:	86.14	92.5^{760}	-51	0.7977_4^{20}	slightly	2.96

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

3-Methylbutanal occurs in orange, lemon, peppermint, eucalyptus, and other oils. It is used in artificial flavors and perfumes (ref. 12).

3-Methylbutanal can be formed by the action of isoamyl alcohol with $Na_2Cr_2O_7$ and H_2SO_4 (ref. 12). It has been detected in samples taken from public drinking water supplies in five U.S. cities (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Several chemists experienced chest discomfort, nausea, vomiting, and headaches while distilling 3-methylbutanal. All recovered in several days without after effects (ref. 13).

The toxicity of higher aldehydes generally decreases with increasing chain length (ref. 13).

Inhalation of 1400 ppm of 2-methylbutanal for 4 hours was lethal to 50 percent of the rats exposed (ref. 4).

LD_{50} (oral, rat): 8,570 mg/kg for 2-methylbutanal (ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4) for 2-methylbutanal and 3-methylbutanal.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 8{,}570 = 3.9 \times 10^5\ \mu g/m^3$

Water, Health: $15 \times 3.9 \times 10^5 = 5.9 \times 10^6\ \mu g/l$

Land, Health: $0.2 \times 5.9 \times 10^6 = 1.2 \times 10^6\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000\ \mu g/l$

Land, Ecology: $0.2 \times 1{,}000 = 200\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 8{,}570 = 916\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 8{,}570 = 694\ \mu g/m^3$

$EPC_{WH1} = 15 \times 694 = 10{,}410\ \mu g/l$

$EPC_{WH2} = 0.4 \times 8{,}570 = 3{,}428\ \mu g/l$

$EPC_{LH} = 0.2 \times 3{,}428 = 686\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/l$

$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

CATEGORY: 1C

PROPYNE: C_3H_4 (methylacetylene, propine). A gas. 01C040

WLN: 2UU1

STRUCTURE:

$CH_3C{\equiv}C\text{-}H$

propyne

PROPERTIES:

Molecular wt: 40.07; mp: -101.5; bp: -23.2^{760}; d: 0.7062_4^{50}; vap. d: 1.38; vap. press: 3,876 mm Hg at 20° C; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Industrial area concentration is reported as 20 ppb (ref. 1). This is equivalent to 32 7 $\mu g/m^3$.

Propyne poses a moderate explosion hazard. It can react vigorously with oxidizing materials (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

Propyne is a simple anesthetic and, in high concentrations, is an asphyxiant (ref. 4).

Animal toxicity studies indicated that 28,700 ppm propyne for 6 months duration at 6 hours per day for 5 weeks resulted in the death of 8 out of 20 rats. Toxic responses included excitement, ataxia, salivation, and tremors (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,650 mg/m^3 (1,000 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.65×10^6 $\mu g/m^3$ (1,000 ppm)

Water, Health: $15 \times 1.65 \times 10^6 = 2.48 \times 10^7$ $\mu g/l$

Land, Health:

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1{,}650/410 = 3{,}929$ $\mu g/m^3$

$EPC_{AH1a} = 1{,}000/420 = 2.38$ ppm

$EPC_{WH1} = 15 \times 3{,}929 = 5.89 \times 10^4$ $\mu g/l$

$EPC_{WH2} = 13.8 \times 1{,}650 = 2.28 \times 10^4$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

01C040
PROPYNE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.7E6 (1,000)		3,929 (2.38)		32.7+
Water, µg/l (ppm Wt)			2.5E7		22,800		
Land, µg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			3,930 (2.4)		
Water, µg/l (ppm Wt)			22,800		
Land, µg/g (ppm Wt)					

+Reported for industrial concentration.

CATEGORY: 1C

BUTYNES: C_4H_6 01C060

1-BUTYNE: (ethylacetylene). A colorless, highly flammable gas or liquid. 01C061

2-BUTYNE: (dimethylacetylene, crotonylene). A flammable liquid. 01C062

WLN:

$H-C\equiv C-CH_2CH_3$

1-butyne

$CH_3-C\equiv C-CH_3$

2-butyne

PROPERTIES:

1-butyne: mol. wt: 54.09; mp: -125.72; bp: 8.1^{760}; d: 0.650_4^{20}; insoluble in water.

2-butyne: mol. wt: 54.09; mp: -32.26; bp: 27.0^{760}; d: 0.6910_4^{20}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Butynes may present an explosion hazard. 2-Butyne may be an explosion hazard in the form of a vapor when exposed to heat or flame (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicity of the butynes is probably similar to that of propyne. They are asphyxiants in high concentrations.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV_{SA} = 5,000 ppm or 1.10×10^4 mg/m^3.

TLV = 1,650 mg/m^3 (1,000 ppm) for propyne.

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	2.2×10^6 µg/m^3 (1,000 ppm)	Air, Ecology:
Water, Health:	$15 \times 2.2 \times 10^6 = 3.3 \times 10^7$ µg/l	Water, Ecology:
Land, Health:	$0.2 \times 3.3 \times 10^7 = 6.6 \times 10^6$ µg/g	Land, Ecology:

* ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2,200/420 = 5,200$ µg/m^3

$EPC_{AH1a} = 1,000/420 = 2.3$ ppm

$EPC_{WH1} = 15 \times 5,200 = 7.8 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 2,200 = 3.0 \times 10^4$ µg/l

$EPC_{LH} = 0.2 \times 3.0 \times 10^4 = 6,000$ µg/g

*Based on TLV for propyne = 1,000 ppm. 1,000 ppm = 2,200 mg/m^3 butyne.

MULTIMEDIA ENVIRONMENTAL GOALS

01C060 BUTYNES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	+Based on Health Effects	Based on Ecological Effects	+ Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.2E6 (1,000)		5,200 (2.3)		
Water, $\mu g/l$ (ppm Wt)			3.3E7		30,000		
Land, $\mu g/g$ (ppm Wt)			6.6E6		6,000		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	+ A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			5,200 (2.3)		
Water, $\mu g/l$ (ppm Wt)			30,000		
Land, $\mu g/g$ (ppm Wt)			6,000		

+Based on data for propyne.

REFERENCES: CATEGORY 1C

Aliphatic Hydrocarbons - Alkynes

1. Wagoner, D. Compilation of Ambient Trace Substances. Draft of Report Prepared by Research Triangle Institute under Contract No. 68-02-1325 for U.S. Environmental Protection Agency. Available from Tucker, W. G., Project Officer, IERL-EPA, Research Triangle Park, NC (1976).

2. Bond, R. G., Straub, C. P., Prober, R., Eds. Handbook of Experimental Control. Vol. 1: Air Pollution. The Chemical Rubber Co., Cleveland, OH (1972).

3. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Acetylene. National Institute for Occupational Safety and Health, U.S. Department of Health Education, and Welfare. HEW Publication No. (NIOSH)76-795 (1976).

4. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

5. American Conference of Govermental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

6. Darley, E. F., and W. W. Heck. Effects of Hydrocarbons and Certain Aldehydes on Vegetation. Air Quality Criteria for Hydrocarbons, National Air Pollution Control Administration, Pub. No. AP-64 (1970).

CATEGORY 2

ALKYL HALIDES

SUBCATEGORY: 2A - Saturated Alkyl Halides

Summary of Subcategory

Total number of compounds in subcategory 27

number of parent compounds with subspecies 2

number of subspecies 7

Number of parent compounds with no MEG values 1

Number of parent compounds with natural background levels only 0

Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity 3

Consent Decree compounds included in subcategory: 17

02A020	Methyl bromide
02A040	Methyl chloride
02A080	Methylene chloride
02A100	Chloroform
02A120	Bromodichloromethane
02A140	Dibromochloromethane
02A160	Bromoform
02A200	Dichlorodifluoromethane
02A220	Trichlorofluoromethane
02A240	Carbon tetrachloride
02A250	Ethyl chloride
02A260	1,2-Dichloroethane
02A280	1,1,1-Trichloroethane
02A290	1,1,2-Trichloroethane
02A300	1,1,2,2-Tetrachloroethane
02A320	Hexachloroethane
02A342	1,2-Dichloropropane

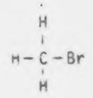
CATEGORY: 2A

METHYL BROMIDE: CH_3Br (monobromomethane). 02A020

A colorless gas or liquid with a burning taste.

WLN: E1

STRUCTURE:



$$H-\overset{H}{\underset{H}{C}}-Br$$

PROPERTIES:

Molecular wt: 94.94; mp: -93.6° C; bp: 3.56^{760}; d: 1.6755^{20}_{4}; vap. d: 3.27; vap. press: 1,420 mm Hg at 20°; solubility in water: 0.09 gm per 100 ml H_2O at 20°; viscosity: 0.397 cp at 0°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as <5 ppt (ref. 1), or <0.02 μg/m³.

Methyl bromide is used for degreasing wool and also for extracting oils from nuts, seeds, and flowers. It serves as an insect fumigant for mills, warehouses, vaults, ships, freight cars, and is also a soil fumigant (ref. 2).

Methyl bromide is dangerous when heated to decomposition as it emits highly toxic fumes of hydrogen bromide (ref. 3).

Although usually odorless, it has a sweetish, chloroform-like odor at high concentrations. It is nonflammable in air, but burns in O_2. Methyl bromide forms a crystalline hydrate, $CH_3Br \cdot 2H_2O$ below 4°.

TOXIC PROPERTIES, HEALTH EFFECTS:

High concentrations of methyl bromide can produce narcosis and fatal pulmonary edema. Chronic, low level exposure can cause central nervous system depression and kidney injury (ref. 2). Inhalation of 35 ppm has produced toxic effects in humans (ref. 4). Locally, methyl bromide is an extreme irritant to the skin and may produce severe burns (ref. 3). Toxic effects from skin exposure to 8,000 ppm are reported (ref. 4).

LC_{Lo} (inhalation, rat): 3,120 ppm/15 min. (ref. 4).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 60 mg/m³ (15 ppm)

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 6.0×10^4 μg/m³ (15 ppm)

Air, Ecology:

Water, Health: $15 \times 6.0 \times 10^4 = 9.0 \times 10^5$ μg/l

Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ μg/l

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 60/420 = 142.86$ μg/m³

$EPC_{AH1a} = 15/420 = 0.04$ ppm

$EPC_{WH1} = 15 \times 142.86 = 2,142.9$ μg/l

$EPC_{WH2} = 13.8 \times 60 = 828$ μg/l

$EPC_{WE1} = 50 \times >1,000 = >5.0 \times 10^4$ μg/m³

MULTIMEDIA ENVIRONMENTAL GOALS

02A020
METHYL BROMIDE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			6.0E4		142.86 (0.04)		>0.02
Water, μg/l (ppm Wt)			9.0E5	1.0E5	828	50,000	
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			142.86 (0.04)		
Water, μg/l (ppm Wt)			828	50,000	
Land, μg/g (ppm Wt)					

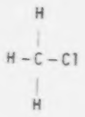
CATEGORY: 2A

WLN: G1

METHYL CHLORIDE: CH_3Cl (chloromethane). 02A040

A colorless, poisonous gas.

STRUCTURE:



$$\begin{array}{c} \quad H \\ \quad | \\ H-C-Cl \\ \quad | \\ \quad H \end{array}$$

PROPERTIES:

Molecular wt: 50.49; mp: -97.73; bp: -24.2; d: 0.9159_4^{20}; vap. d: 1.78; vap. press: 5 atmospheres at 22° C; slightly soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The concentration of methyl chloride in rural atmosphere is reported as 530 ppt (ref. 1). This is equivalent to 0.530 ppb or 1.09 $\mu g/m^3$. The odor recognition level for methyl chloride is 22.5 mg/m^3 (ref. 3).

Methyl chloride may be explosive in air in range of 10.7 to 17.2 percent by volume (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methyl chloride as well as its metabolites, methanol and hydrochloric acid, are toxic to animals and humans. Severe poisoning results in effects to the central nervous system and other effects upon the liver, kidneys, and bone marrow (ref. 3). Concentrations below 30 ppm (average time-weighed exposure) appear to have no effect on exposed workers (ref. 5).

LD_{50} (oral, rat): 1,800 mg/kg.

LC_{Lo} (inhalation, rat): 6,500 mg/m^3.

Aquatic toxicity: TLm 96: over 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 210 mg/m^3 (100 ppm).

Chlorinated hydrocarbons are under consideration for addition to the list of compounds for Toxic Pollutant Effluent Standards (ref. 6).

On EPA Consent Decree Priority II List.

Candidate for Second Priority Chemical List of the Chemical Industry. Institute of Toxicology (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.1×10^5 $\mu g/m^3$ (100 ppm)

Water, Health: $15 \times 2.1 \times 10^5 = 3.2 \times 10^6$ $\mu g/\ell$

Land, Health:

Air, Ecology:

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ $\mu g/\ell$

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 210/420 = 500$ $\mu g/m^3$

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 500 = 7{,}500$ $\mu g/\ell$

$EPC_{WH2} = 13.8 \times 210 = 2{,}900$ $\mu g/\ell$

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ $\mu g/\ell$

MULTIMEDIA ENVIRONMENTAL GOALS

02A040
METHYL CHLORIDE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			2.1E5 (100)		500 (0.24)		
Water, μg/l (ppm Wt)			3.2E6	1.0E5	2,900	50,000	
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

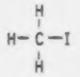
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			500 (0.24)		
Water, μg/l (ppm Wt)			2,900	50,000	
Land, μg/g (ppm Wt)					

CATEGORY: 2A

METHYL IODIDE: CH_3I (iodomethane). A colorless liquid. Turns brown on exposure to light. 02A060

WLN: I1

STRUCTURE:



$$H-\overset{\displaystyle H}{\underset{\displaystyle H}{C}}-I$$

PROPERTIES:

Molecular wt: 141.94; mp: -66.45; bp: 42.4^{760}; d: 2.279_4^{20}; vap. d: 4.89; vap. press: 400 mm at 25.3° C; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 10 ppt (ref. 1).or 0.06 $\mu g/m^3$.

Methyl iodide is used primarily as a chemical intermediate. It has been proposed as a fire extinguisher and an insecticidal fumigant (ref. 21).

It has been proposed that methyl iodide may originate biologically in the oceans (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methyl iodide appears to be primarily a central nervous system depressant (ref. 21). may cause lung irritation and produce severe narcosis. Prolonged contact with the skin can cause vesicant burns (ref. 2). Methyl iodide is readily hydrolyzed to give inorganic iodine, which appears in the tissues and in urine (ref. 21).

LD_{50} (oral, rat): 200 mg/kg (ref. 3).

LC_{Lo} (inhalation, rat): 3790 ppm for 15 minutes; (mouse): 426 mg/m^3 for 24 hours (ref. 4).

Methyl iodide is reported to produce oncogenic responses in rats. The EPA/NIOSH ordering number is 4101, and the lowest dose to produce an oncogenic response is 50 mg/kg. The adjusted ordering number is 82. It is believed to act by direct alkylation at the injection site (ref. 9).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 28 mg/m^3 (5 ppm).

Halomethanes are included on EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/82 = 854\ \mu g/m^3$

Water, Health: $15 \times 854 = 1.28 \times 10^4\ \mu g/l$

Land, Health: $0.2 \times 1.28 \times 10^4 = 2.56 \times 10^3\ \mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 28/420 = 66.67\ \mu g/m^3$

$EPC_{AH1a} = 5/420 = 0.01$ ppm

$EPC_{WH1} = 15 \times 66.67 = 1{,}000\ \mu g/l$

$EPC_{WH2} = 13.8 \times 28 = 386\ \mu g/l$

$EPC_{LH} = 0.2 \times 386 = 77\ \mu g/g$

$EPC_{AC2} = 10^3/(6 \times 82) = 2.0\ \mu g/m^3$

$EPC_{WC} = 15 \times 2.0 = 30\ \mu g/l$

$EPC_{LC} = 0.2 \times 30 = 6.0\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

02A060
METHYL IODIDE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			8.54E2		2.0		0.06 (0.01)
Water, μg/l (ppm Wt)			1.28E4		30		
Land, μg/g (ppm Wt)			2.56E3		6.0		

*To be multiplied by dilution factor

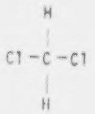
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			66.67 (0.01)		2.0
Water, μg/l (ppm Wt)			386		30
Land, μg/g (ppm Wt)			77		6.0

CATEGORY: 2A

WLN: G1G

METHYLENE CHLORIDE: CH_2Cl_2 (dichloromethane, methylene bichloride). 02A080
A colorless liquid.

STRUCTURE:



$$H-\overset{\displaystyle H}{\underset{\displaystyle H}{C}}$$

$$Cl-\underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}}-Cl$$

PROPERTIES:

Molecular wt: 84.94; mp: -95.1; bp: 40; d: 1.3266^{20}_{4};
vap. press: 400 mm at 24.1° C; vap. d: 2.93; soluble in about
50 parts water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The concentration of dichloromethane in rural atmosphere is reported as 3.0 ppt (ref. 1). This is equivalent to 0.003 ppb or 0.01 $\mu g/m^3$. The odor threshold ranges from 25 to 50 ppm (ref. 3).

Methylene chloride is permitted as an additive to food for human consumption by the Food and Drug Administration (ref. 10). Its principle use is as a solvent in food processing.

Methylene chloride has been identified in samples from public drinking water supplies in concentrations of $< 5.0\ \mu g/\ell$ (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

The primary effect of exposure via inhalation of methylene chloride is temporary narcosis; it is, however, dangerous to the eyes (ref. 3). Severe poisoning has resulted from exposure to very high concentrations (several thousand ppm). Exposure to 500 ppm for 1 year has resulted in effects to the central nervous system (ref. 4). Tests on nearly 2,000 animals at levels as high as 3,500 ppm show methylene chloride to be relatively innocuous, and did not indicate any carcinogenic response (ref. 12).

LD_{50} (oral, rat): 2,136 mg/kg.

LD_{Lo} (inhalation, guinea pig): 5,000 ppm/2 hr.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Methylene chloride is the subject of a NIOSH Criteria Document. Recommendation for occupational exposure is 75 ppm, time-weighted average, with a peak concentration of 500 ppm (ref. 13). 75 ppm is equivalent to approximately 260 mg/m^3.

TLV = 720 mg/m^3 (200 ppm).

On EPA Consent Decree List, Priority 2.

On Chemical Industry Institute of Toxicology Priority 1 List (ref. 14).

Chlorinated hydrocarbons are under consideration for addition to the list of compounds for Toxic Effluent Standards (ref. 6).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $2.60 \times 10^5\ \mu g/m^3$ (75 ppm)
Water, Health: $15 \times 2.60 \times 10^5 = 3.9 \times 10^6\ \mu g/\ell$
Land, Health: $0.2 \times 3.9 \times 10^6 = 7.8 \times 10^5\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 260/420 = 619\ \mu g/m^3$ (0.2 ppm)
$EPC_{WH1} = 15 \times 619 = 9,180\ \mu g/\ell$
$EPC_{WH1} = 13.8 \times 260 = 3,590\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 3,590 = 718\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 5,000 = 1.0 \times 10^3\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02A080
METHYLENE CHLORIDE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.6E5 (75)		619 (0.2)		0.01
Water, $\mu g/l$ (ppm Wt)			3.9E6	1.0E4	3,590	5,000	<5†
Land, $\mu g/g$ (ppm Wt)			7.8E3	2.0E1	718	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			619 (0.2)		
Water, $\mu g/l$ (ppm Wt)			3,590	5,000	
Land, $\mu g/g$ (ppm Wt)			718	1,000	

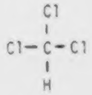
†Public drinking water.

CATEGORY: 2A

CHLOROFORM: $CHCl_3$ (trichloromethane,
methane trichloride) 02A100
A clear, colorless, nonflammable liquid with an ethereal odor.

WLN: GYGG

STRUCTURE:



$$Cl-\overset{\overset{Cl}{|}}{\underset{\underset{H}{|}}{C}}-Cl$$

PROPERTIES:

Molecular wt: 119.38; mp: -63.5; bp: 61.7^{760}; d: 1.4832^{20}_{4}; vap. d: 4.12; vap. press: 100 mm at 10.4° C; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 26.5 ppt (ref. 1), or 0.13 $\mu g/m^3$. Odor detection begins at 205 to 307 ppm (ref. 8).

When exposed to air and light, photochemical transformation to phosgene, HCl, and chlorine occurs (ref. 15). Chloroform is also easily hydrolyzed by alkali to formic acid (ref. 15).

Chloroform is used as a solvent, as a cleansing agent, in fire extinguishers, and in the rubber industry (ref. 2). It can be formed by the chlorination of methane (ref. 16).

Detection methods for chloroform include electron-capture gas chromatography (ref. 15), infrared spectrophotometry, and a colorimetric method (ref. 16).

Chloroform is found in estuarine and coastal waters and in chlorinated water from treatment processes (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

The most outstanding effect from acute exposure is depression of CNS, liver and kidney injury, and possibly cardiac sensitization (ref. 5). Alcohols, barbiturates, and other chemicals such as DDT, when administered before chloroform, increase the toxic effects, apparently by lowering the threshold for its action (ref. 16).

Enlarged livers were reported in 25 percent of 68 workers with chloroform concentration in air from 10 to 200 ppm. Hepatotoxicity is less than that of carbon tetrachloride (ref. 5).

Chloroform is rapidly absorbed from the lungs and distributed in the body. Most of the chloroform is excreted as such by the lungs. A portion may be metabolized and excreted as chloride in the urine (ref. 8). Human death has resulted from ingestion of 140 mg/kg (ref. 4).

LD_{50} (oral, rat): 800 mg/kg (ref. 4).

LC_{50} (inhalation, mouse): 28 ppm; (rat): 8,000 ppm for 4 hours; (rabbit): 59 ppm (ref. 4).

Chloroform has produced tumors in rats and mice when fed in high dosages. The EPA/NIOSH ordering number is 4212. The lowest effective dosage is 18 g. The adjusted ordering number is 0.234.

Inhalation of 100 ppm/7 hours for 10 days produced teratogenic effects in rats. 100 ppm is equivalent to 487 mg/m^3. Assuming absorption of the total amount of contaminant in the breathing volume, this concentration over 10 days for 7 hours per day corresponds to a dosage of 1,321 mg/kg. (The weight of the rat is estimated as 113 g and tidal breathing rate as 0.073 l/min) (refs. 4,17). Adjusted ordering number based on teratogenicity is 3.21.

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 120 mg/m^3 (25 ppm). Intended change (1976) is 50 mg/m^3 (10 ppm).

Chloroform is the subject of a NIOSH Criteria Document (1974) and a revised document (1976)(ref. 16). The NIOSH recommendation for occupational exposure is 2 ppm as a 1 hour ceiling. 2 ppm is equivalent to 10 mg/m^3. Chloroform has been banned by the FDA from use in drugs, cosmetics, and food packaging products (ref. 2).

Chloroform is on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.0×10^4 $\mu g/m^3$ (2 ppm)

Water, Health: $15 \times 1.0 \times 10^4 = 1.5 \times 10^5$ $\mu g/l$

Land, Health: $0.2 \times 1.5 \times 10^5 = 3.0 \times 10^4$ $\mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1,000$ $\mu g/l$

Land, Ecology: $0.2 \times 1,000 = 200$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 10/420 = 23$ $\mu g/m^3$

$EPC_{AH1a} = 2/420 = 0.005$ ppm

$EPC_{WH1} = 15 \times 23 = 345$ $\mu g/\ell$

$EPC_{WH2} = 13.8 \times 10 = 138$ $\mu g/\ell$

$EPC_{LH} = 0.2 \times 138 = 28$ $\mu g/g$

$EPC_{WE1} = 50 \times 10 = 500$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 500 = 100$ $\mu g/g$

$EPC_{AT} = 10^3/(6 \times 3.21) = 52$ $\mu g/m^3$

$EPC_{WT} = 15 \times 52 = 778$ $\mu g/\ell$

$EPC_{LT} = 0.2 \times 778 = 156$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02A100
CHLOROFORM

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E4 (2)		23 (0.005)		0.13 (0.027)
Water, $\mu g/l$ (ppm Wt)			1.5E5	1.0E3	138	500	
Land, $\mu g/g$ (ppm Wt)			3.0E4	2.0E2	28	100	

*To be multiplied by dilution factor

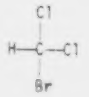
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			23 (0.005)		52
Water, $\mu g/l$ (ppm Wt)			138	500	778
Land, $\mu g/g$ (ppm Wt)			28	100	156

CATEGORY: 2A

BROMODICHLOROMETHANE: $CHCL_2Br$ (dichlorobromomethane) 02A120
A colorless liquid.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 163.83; mp: -57.1; bp: 90^{760}; d: 1.980^{20}_{4}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Bromodichloromethane has been detected in samples taken from public drinking water supplies in eight U.S. cities. The highest concentration was 73 µg/l in Miami, Florida (ref. 11). It has also been identified in estuarine and coastal waters. Bromodichloromethane is generally found in chlorinated water and probably originates in part from the water treatment process (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

No specific toxicological data are available; however, bromodichloromethane is believed to be narcotic in high concentrations (ref. 3). Because of its structural similarity to chloroform, bromoform, and methylene chloride, and methylene chlorobromide, it is likely to result in central nervous system depression.

There is no evidence to suggest that bromodichloromethane exhibits genotoxic properties. (ref. 18) When administered intragastrically (0.1 ml, 40% in oil solution) to 58 mice, no tumors were observed. This dosage is approximately equivalent to 1,600 mg/kg. Survival dosage for 10 of the 58 mice was approximately 3 g/kg. (ref. 19).

On the basis of lethal dose information for structurally similar compounds, the LD_{50} for bromodichloromethane is estimated to be >1,000 mg/kg. See table below:

Compound	LD_{50} (oral, rat) mg/kg	LD_{50} (subcutaneous, mouse) mg/kg
$CHCl_3$	800	
CH_2Cl_2	2,136	
CH_2ClBr	5,000	
CH_2Br_2		3,738
$CHBr_3$		1,820

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On the EPA Consent Decree List, Priority 2.

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1,000 = 4.5 \times 10^4$ µg/m^3

Water, Health: $15 \times 4.5 \times 10^4 = 6.75 \times 10^5$ µg/ℓ

Land, Health: $0.2 \times 6.75 \times 10^5 = 1.35 \times 10^5$ µg/g

* ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1,000 = 107$ µg/m^3

$EPC_{AH3} = 0.081 \times 1,000 = 81$ µg/m^3

$EPC_{WH1} = 15 \times 81 = 1,215$ µg/ℓ

$EPC_{WH2} = 0.4 \times 1,000 = 400$ µg/ℓ

$EPC_{LH} = 0.2 \times 400 = 80$ µg/g

*Based on acute toxicity data for structurally similar compounds.

MULTIMEDIA ENVIRONMENTAL GOALS

02A120 BROMODICHLOROMETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, µg/m³ (ppm Vol)			4.5E4		81		
Water, µg/l (ppm Wt)			6.8E5		400		
Land, µg/g (ppm Wt)			1.4E5		80		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m³ (ppm Vol)			81		
Water, µg/l (ppm Wt)			400		
Land, µg/g (ppm Wt)			80		

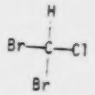
†Based on acute toxicity data for structurally similar compounds.

CATEGORY: 2A

DIBROMOCHLOROMETHANE: $CHClBr_2$ (chlorodibromomethane) 02A140
A colorless to pale yellow liquid.

WLN:

STRUCTURE:



$\mathrm{Br{-}\overset{H}{\underset{Br}{C}}{-}Cl}$

PROPERTIES:
Molecular wt: 208.29; bp: 119^{760}; d: 2.451^{20}_{4}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Dibromochloromethane has been found in samples taken from public drinking water supplies in nine U.S. cities. The highest concentration, 32 μg/l, was found in Miami, Florida (ref. 7). It is used in the manufacturing of fire extinquishing agents, aerosol propellants, refrigerants, pesticides, and in organic synthesis (ref. 19).

TOXIC PROPERTIES, HEALTH EFFECTS:

No specific toxicological data are available but because of its structural similarity to chloroform and bromoform, it is likely to result in Central Nervous System depression. Compounds of this type are generally irritant and narcotic (ref. 3).

On the basis of lethal dose information for structurally similar compounds, the LD_{50} for dibromochloromethane is estimated to be >1,000 mg/kg.

Compound	LD_{50}(oral, rat) mg/kg	LD_{50} (subcutaneous, mouse) mg/kg
$CHCl_3$	800	-
CH_2Cl_2	2,136	-
CH_2ClBr	5,000	-
CH_2Br_2	-	3,738
$CHBr_3$	-	1,820

Evidence of carcinogenicity: Dibromochloromethane has been reported to be mutagenic to Salmonella typhimurium in the Ames bioassay test (ref. 28). However, dibromochloromethane has been administered intragastrically (0.1 ml, 40% in oil) to 28 mice; no tumors were produced (ref. 18).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On the EPA Consent Decree List, Priority 2.

*** MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health: $45 \times 1,000 = 4.5 \times 10^4\ \mu g/m^3$

Water, Health: $15 \times 4.5 \times 10^4 = 6.75 \times 10^5\ \mu g/\ell$

Land, Health: $0.2 \times 9.75 \times 10^5 = 1.35 \times 10^5\ \mu g/g$

*** ESTIMATED PERMISSIBLE CONCENTRATIONS**:

$EPC_{AH2} = 0.107 \times 1,000 = 107\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 1,000 = 81\ \mu g/m^3$

$EPC_{WH1} = 15 \times 81 = 1,215\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 1,000 = 400\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 400 = 80\ \mu g/g$

*Based on acute toxicity data for structurally similar compounds.

MULTIMEDIA ENVIRONMENTAL GOALS

02A140
DIBROMOCHLOROMETHANE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			4.5E4		81		
Water, μg/l (ppm Wt)			6.8E5		400		
Land, μg/g (ppm Wt)			1.4E5		80		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration †		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			81		
Water, μg/l (ppm Wt)			400		
Land, μg/g (ppm Wt)			80		

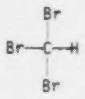
†Based on acute toxicity data for structurally similar compounds.

CATEGORY: 2A

BROMOFORM: $CHBr_3$ (tribromomethane). 02A160
A colorless, nonflammable liquid, with sweetish taste and a chloroform odor.

WLN: EYEE

STRUCTURE:



$$\mathrm{Br{-}\overset{\displaystyle Br}{\underset{\displaystyle Br}{\overset{|}{\underset{|}{C}}}}{-}H}$$

PROPERTIES:

Molecular wt: 252.75; mp: 8.3° C; bp: 149.5^{760}; d: 2.8899^{20}_{4}; vap. d: 8.7; vap. press: 5.6 mm Hg at 25° C; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Bromoform has been found in samples taken from drinking water supplies in 5 U.S. cities. Concentrations ranged from 0.2 to 3.0 μg/l, with the largest concentration found in Tucson, Arizona (ref. 11).

Air and light accelerate the decomposition of bromoform to a yellow color (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Bromoform vapor causes irritation of the respiratory tract, pharynx, and larynx. It produces lacrimation and salivation. It is absorbed through the lungs, the gastrointestinal tract, and through the skin (ref. 5).

Bromoform produces depression of the CNS resulting in narcosis (ref. 8). It can also cause liver injury (ref. 3).

LD_{50} (subcutaneous, mouse): 1,820 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Bromoform is included in the EPA Consent Decree List, Priority 2.

TLV = 5 mg/m^3 (0.5 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	5,000 $\mu g/m^3$ (0.5 ppm)	Air, Ecology:	
Water, Health:	$15 \times 5{,}000 = 7.5 \times 10^4$ μg/l	Water, Ecology:	
Land, Health:	$0.2 \times 7.5 \times 10^4 = 1.5 \times 10^4$ μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 5/420 = 11.9\ \mu g/m^3$

$EPC_{AH1a} = 0.5/420 = 0.001$ ppm

$EPC_{WH1} = 15 \times 11.9 = 179\ \mu g/l$

$EPC_{WH2} = 13.8 \times 5 = 69\ \mu g/l$

$EPC_{LH} = 0.2 \times 69 = 13.8\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02A160
BROMOFORM

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E3 (0.5)		11.9 (.001)		
Water, $\mu g/l$ (ppm Wt)			7.5E4		69		0.2-3.0+
Land, $\mu g/g$ (ppm Wt)			1.5E4		13.8		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			11.9 (.001)		
Water, $\mu g/l$ (ppm Wt)			69		
Land, $\mu g/g$ (ppm Wt)			13.8		

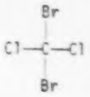
+Public drinking water supplies.

CATEGORY: 2A

DIBROMODICHLOROMETHANE: CCl_2Br_2. 02A180

WLN:

STRUCTURE:



$$\begin{array}{c} Br \\ | \\ Cl—C—Cl \\ | \\ Br \end{array}$$

PROPERTIES:

Molecular wt: 242.74; mp: 38; bp: 150.2;
d: 2.42^{25}_{0}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for dibromodichloromethane are unavailable at this time. Structurally similar compounds include carbon tetrabromide and carbon tetrachloride. Acute toxicity of these compounds is low as indicated by the LD_{50} values given below:

Compound	LD_{50} (oral, rat) mg/kg
Carbon tetrabromide	1,000
Carbon tetrachloride	1,770

Chronic exposure to both compounds is reported to result in liver injury (ref. 5). It should be noted also that carbon tetrachloride is recognized as a potential carcinogen (refs. 4,29).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 65 mg/m^3 (10 ppm) for carbon tetrachloride.

TLV = 1.4 mg/m^3 (0.1 ppm) for carbon tetrabromide.

NIOSH recommendation for carbon tetrachloride is 2 ppm as a ceiling for occupational exposure. (This recommendation takes into consideration the association of liver cancer with this compound)(ref. 27).

*** MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health: 1.4×10^3 μg/m^3

Water, Health: $15 \times 1.4 \times 10^3 = 2.1 \times 10^4$ μg/ℓ

Land, Health: $0.2 \times 2.1 \times 10^4 = 4.2 \times 10^3$ μg/g

*** ESTIMATED PERMISSIBLE CONCENTRATIONS**:

$EPC_{AH1} = 10^3 \times 1.4/420 = 3.3$ μg/m^3

$EPC_{AH1a} = 0.1/420 = 0.0002$ ppm

$EPC_{WH1} = 15 \times 3.3 = 49.5$ μg/ℓ

$EPC_{WH2} = 13.8 \times 1.4 = 19$ μg/g

$EPC_{LH} = 0.2 \times 19 = 4$ μg/g

*Based on TLV for carbon tetrabromide.

MULTIMEDIA ENVIRONMENTAL GOALS

02A180
DIBROMODICHLOROMETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent†		B. Ambient Level Goal*†		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.4E3		3.3 (0.0002)		
Water, $\mu g/l$ (ppm Wt)			2.1E4		19		
Land, $\mu g/g$ (ppm Wt)			4.2E3		4		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			3.3 (0.0002)		
Water, $\mu g/l$ (ppm Wt)			19		
Land, $\mu g/g$ (ppm Wt)			4		

†Based on TLV for carbon tetrabromide.

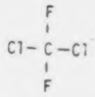
CATEGORY: 2A

WLN: GXGFF

DICHLORODIFLUOROMETHANE: CCl_2F_2 (difluorodichloromethane). 02A200

A colorless, nonflammable gas. At low concentrations is practically odorless; faint ether-like odor at high concentrations.

STRUCTURE:



$$\begin{array}{c} F \\ | \\ Cl-C-Cl \\ | \\ F \end{array}$$

PROPERTIES:

Molecular wt: 120.91; mp: -158; bp: -29.8^{760}; d: $1.75^{\cdot 113}$; vap. d: 4.1; vap. press: 5 atmospheres at 16.1° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Dichlorodifluoromethane is used as a refrigerant and an aerosol propellant (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Dichlorodifluoromethane may produce narcosis in very high concentrations (ref. 2). Animal studies indicate very low toxicity (ref. 21).

When heated to decompositon, it emits highly toxic fumes of phosgene and fluorides (ref. 3).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Dichlorodifluoromethane is included on the EPA Consent Decree List, Priority 2.

TLV = 4,950 mg/m^3 (1,000 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 4.95×10^6 $\mu g/m^3$ (1,000 ppm)
Water, Health: $15 \times 4.95 \times 10^6 = 7.43 \times 10^7$ $\mu g/l$
Land, Health:

Air, Ecology:
Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ $\mu g/l$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 4,950/420 = 1.2 \times 10^4$ $\mu g/m^3$
$EPC_{AH1a} = 1,000/420 = 2.38$ ppm
$EPC_{WH1} = 15 \times 1.2 \times 10^4 = 1.77 \times 10^5$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 4,950 = 6.83 \times 10^4$ $\mu g/l$

$EPC_{WE1} = 50 \times >1,000 = >5.0 \times 10^4$ $\mu g/l$

MULTIMEDIA ENVIRONMENTAL GOALS

02A200
DICHLORODIFLUOROMETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.95E6 (1,000)		12,000 (2.38)		
Water, $\mu g/l$ (ppm Wt)			7.43E7	>1.0E5	68,300	>50,000	
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

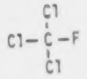
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			12,000 (2.38)		
Water, $\mu g/l$ (ppm Wt)			68,300	>50,000	
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 2A

WLN: GXGGF

TRICHLOROFLUOROMETHANE: CCl_3F (trichloromonofluoromethane fluorotrichloromethane, freon 11). 02A220
A colorless, nonflammable gas or liquid, with a faint ethereal odor.

STRUCTURE:



$$Cl-\overset{\displaystyle Cl}{\underset{\displaystyle Cl}{C}}-F$$

PROPERTIES:

Molecular wt: 137.38; mp: -111.0; bp: 23.7^{760}; d: 1.494_{4}^{172}; vap. d: 4.7; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Trichlorofluoromethane has been detected in samples taken from public drinking water supplies in 4 U.S. cities (ref. 11).

It is used in refrigeration machinery requiring a refrigerant effective at negative pressures, and as an aerosol propellant (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Trichlorofluoromethane may be narcotic in high concentrations (ref. 2).
LC_{Lo} (inhalation, rat): 10% for 20 min. (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Trichlorofluoromethane is included on the EPA Consent Decree List, Priority 2.

TLV = 5,600 mg/m^3 (1,000 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	5.6×10^6 μg/m^3 (1,000 ppm)	Air, Ecology:
Water, Health:	$15 \times 5.6 \times 10^6 = 8.4 \times 10^7$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 8.4 \times 10^7 = 1.68 \times 10^7$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 5{,}600/420 = 1.33 \times 10^4$ μg/m^3

$EPC_{AH1a} = 1{,}000/420 = 2.38$ ppm

$EPC_{WH1} = 15 \times 1.33 \times 10^4 = 2.0 \times 10^5$ μg/l

$EPC_{WH2} = 13.8 \times 5{,}600 = 7.73 \times 10^4$ μg/l

$EPC_{LH} = 0.2 \times 7.73 \times 10^4 = 1.55 \times 10^4$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A220
TRICHLOROFLUOROMETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.6E6 (1000)		13,300 (2.38)		
Water, $\mu g/l$ (ppm Wt)			8.4E7		77,300		
Land, $\mu g/g$ (ppm Wt)			1.7E7		15,500		

*To be multiplied by dilution factor

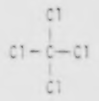
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			13,300 (2.38)		
Water, $\mu g/l$ (ppm Wt)			77,300		
Land, $\mu g/g$ (ppm Wt)			15,500		

CATEGORY: 2A

WLN: GXGGG

CARBON TETRACHLORIDE: CCl_4 (tetrachloromethane, perchloromethane, necatorina). 02A240.
A colorless, clear, nonflammable liquid, with an ethereal odor.

STRUCTURE:



$$Cl-\underset{Cl}{\overset{Cl}{C}}-Cl$$

PROPERTIES:
Molecular wt: 153.82; mp: -22.99; bp: 76.54^{760}; d: 1.5940^{20}_{4}; vap. d: 5.3; vap. press: 100 mm at 23.0° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 110 ppt (ref. 1), or 0.69 $\mu g/m^3$. It has also been detected in samples from public drinking water supplies in 8 U.S. cities (ref. 11).

Carbon tetrachloride has been detected in food. It has been found in wheat after fumigation (up to 50 ppm) and in flour; cereals, 50 ppm; bread and cooked cereal products, 0.05 ppm (ref. 15).

Uses include fire extinguisher, cloth cleaner, solvent, insecticide, starting material in the manufacture of organic compounds (ref. 2).

It is chemically not reactive; not easily hydrolyzed. When heated to decomposition, it may form phosgene, CO_2, HCl, and chlorine (ref. 15).

Carbon tetrachloride can be formed by the chlorination of hydrocarbons (ref. 2).

Odor threshold is 79 ppm (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

Carbon tetrachloride has a narcotic action resembling chloroform (ref. 3). High concentrations cause central nervous system depression. Lower concentrations cause dizziness, vertigo, headache, depression, and mental confusion (ref. 21). Long term exposure can also produce dermatitis (ref. 3). Functional and destructive injury of the liver and kidney may occur after acute exposure, but such damage is more favored by long term chronic exposure. In such cases, damage to the liver predominates (ref. 21).

Inhalation of 1000 ppm and the ingestion of 60 mg/kg has proven fatal for humans (ref. 4). Alcohol intensifies the toxic action of carbon tetrachloride (ref. 2).

Animal studies concerned with the metabolic fate of carbon tetrachloride show that 51% of CCl_4 absorbed was eliminated in expired air, 4.4 % as CO_2 and the remainder excreted (ref. 21).

LD_{50} (oral, rat): 1770 mg/kg (ref. 4).

LC_{50} (inhalation, mouse): 9526 ppm/8H (ref. 4).

Carbon tetrachloride has been demonstrated to be carcinogenic in rats, mice, and hamsters (ref. 15). The EPA/NIOSH ordering number is 4323. The losest dosage eliciting oncogenic response is 3680 mg/kg. The adjusted ordering number is 1.17.

Carbon tetrachloride is also a teratogen. Inhalation of 300 ppm for 10 days has produced teratogenic effects in mice (ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 65 mg/m^3 (10 ppm).

Carbon tetrachloride is the subject of a NIOSH Criteria Document (1975) and a revised document (1976)(ref. 16). The recommendation for occupational exposure is 2 ppm for a 60 minute ceiling. 2 ppm is equivalent to 12.6 mg/m^3.

Carbon tetrachloride has been banned by FDA from household use. It is also on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 12.6 = 1.3 \times 10^4$ $\mu g/m^3$ (2 ppm)
Water, Health: $15 \times 1.3 \times 10^4 = 2.0 \times 10^5$ $\mu g/l$
Land, Health: $0.2 \times 2.0 \times 10^5 = 4.0 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 10 = 1{,}000$ $\mu g/l$
Land, Ecology: $0.2 \times 1{,}000 = 200$ $\mu g/l$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 12.6/420 = 30\ \mu g/m^3$
$EPC_{AH1a} = 2/420 = 0.005$ ppm
$EPC_{WH1} = 15 \times 30 = 450\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 12.6 = 173.9\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 173.9 = 34.8\ \mu g/g$
$EPC_{AC2} = 10^3/(6 \times 1.2\ ) = 142.5\ \mu g/m^3$
$EPC_{WC} = 15 \times 142.5 = 2137.5\ \mu g/\ell$
$EPC_{LC} = 0.2 \times 2137.5 = 427.5\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/\ell$
$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02A240
CARBON TETRACHLORIDE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.3E4 (2)		30 (0.005)		0.69
Water, $\mu g/l$ (ppm Wt)			2.0E5	1.0E3	174	500	
Land, $\mu g/g$ (ppm Wt)			4.0E4	2.0E3	35	100	

*To be multiplied by dilution factor

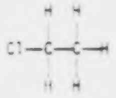
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			30 (0.005)		142.5
Water, $\mu g/l$ (ppm Wt)			174	500	2137.5
Land, $\mu g/g$ (ppm Wt)			35	100	427.5

CATEGORY: 02A

ETHYL CHLORIDE: C_2H_5Cl. (Chloroethane, monochloroethane, chloroethyl). A colorless flammable gas with a burning taste. 02A250

WLN:

STRUCTURE:



$$Cl-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-H$$

PROPERTIES:
Molecular wt: 64.52; mp: 137.7; bp: 12.2; d: 0.9214^0_4; vap. press: 1000 mm at 20°C; vap. d: 2.22; solubility in water: .57 g per 100 mℓ at 20°C.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethyl chloride is used a topical anesthetic and as a refrigerant (ref. 2). It is prepared by the action of chlorine on ethylene in the presence of HCl and light (ref. 2). The compound has been identified in drinking water (ref. 23).

A level of 5,000 ppb has been identified in rural atmosphere (ref. 1). This is equivalent to 13 µg/m^3.

TOXIC PROPERTIES, HEALTH EFFECTS:

Ethyl chloride is the least toxic of the chlorinated hydrocarbons (ref. 3). It is mildly irritating to mucous membranes (ref. 2). Acute exposure can result in narcosis and eye irritation for high concentrations (over 10,000 ppm). Central nervous system effects in humans have resulted from exposure to 13,000 ppm (ref. 4).

The toxic effects of ethyl chloride on guinea pigs via inhalation include irritation of the lung, liver, and kidneys (ref. 21). The toxic effects resemble those of methyl chloride, although the threshold for ethyl chloride is much greater (ref. 21).

LC_{Lo} (inhalation, guinea pig): 4,000 ppm/45 min.

Aquatic toxicity: TLm 96 >1,000 ppm

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 2,600 mg/m^3 (1,000 ppm)

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.6×10^5 µg/m^3 (1,000 ppm)

Air, Ecology:

Water, Health: $15 \times 2.6 \times 10^6 = 3.9 \times 10^7$ µg/ℓ

Water, Ecology: $100 \times 1,000 = 1 \times 10^5$ µg/ℓ

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2,600/420 = 6,190$ µg/m^3

$EPC_{AH1a} = 1,000/420 = 2.4$ ppm

$EPC_{WH1} = 15 \times 6,190 = 92,850$ µg/ℓ

$EPC_{WH2} = 13.8 \times 2,600 = 35,880$ µg/ℓ

$EPC_{WE1} = 50 \times 1,000 = 50,000$ µg/ℓ

MULTIMEDIA ENVIRONMENTAL GOALS

02A250
ETHYL CHLORIDE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factor				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.6E6 (1,000)		6,190 (2.4)		13
Water, $\mu g/l$ (ppm Wt)			3.9E7	1.0E5	35,880	50,000	
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

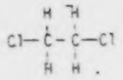
AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			6,190 (2.4)		
Water, $\mu g/l$ (ppm Wt)			35,880	50,000	
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 2A

1,2-DICHLOROETHANE: $ClCH_2CH_2Cl$ (ethylene chloride, ethylene dichloride, glycol dichloride) 02A260
A colorless, sweet tasting, flammable liquid with a pleasant odor.

WLN: G2G

STRUCTURE:



$$\begin{array}{ccccccc} & & H & & H & & \\ & & | & & | & & \\ Cl & - & C & - & C & - & Cl \\ & & | & & | & & \\ & & H & & H & & \end{array}$$

PROPERTIES:

Molecular wt: 98.96; mp: -35.36; bp: 83.47^{760}; d: 1.2351^{20}; vap. d: 3.35; vap. press: 100 mm at 29.4° C; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,2-Dichloroethane has been detected in samples from public drinking water supplies in 3 U.S. cities (ref. 11).

Odor threshold is 50 ppm in air (ref. 21). It is possible to become adapted to the odor at low concentrations (ref. 21).

1,2-Dichloroethane is used as a solvent, a soil fumigant, a food additive permitted in food for human consumption, and in antiknock gasoline (ref. 21).

Explosive limits are 6.2 to 15.9 percent by volume in air (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

As a vapor or fumigant, 1,2-dichloroethane may produce irritation of the respiratory tract and conjunctiva, corneal clouding, equilibrium disturbances, narcosis, and abdominal cramps (ref. 2).

1,2-Dichloroethane is readily absorbed by the lungs or via the gastrointestinal tract when taken orally. To a lesser extent, it is absorbed through the skin (ref. 21).

Workers exposed for 2 to 5 months to 1,2-dichloroethane developed central nervous system depression and gastrointestinal upset with nausea and vomiting. The workers recovered when removed from exposure (ref. 21). Exposure via inhalation to 4,000 ppm for 1 hr has produced toxic effects in humans (ref. 4). Consumption of 845 mg/kg has resulted in human death (ref. 4).

1,2-Dichloroethane is reported to produce cancer in mice and rats (ref. 30).

LD_{50} (oral, rat): 680 mg/kg (ref. 4).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

1,2-Dichloroethane is on the EPA Consent Decree List, Priority 2.

TLV = 200 mg/m^3 (50 ppm).

Ethylene dichloride is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 5 ppm or 20 mg/m^3 as a time-weighted average (ref. 22). Ethylene dichloride is included in the Second Priority Chemical List of the Chemical Industry Institute of Toxicology (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.0×10^{4} μg/m^3 (5 ppm)
Water, Health: $15 \times 2.0 \times 10^{4} = 3.0 \times 10^{5}$ μg/l
Land, Health: $0.2 \times 3.0 \times 10^{5} = 6.0 \times 10^{4}$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^{4}$ μg/l
Land, Ecology: $0.2 \times 1.0 \times 10^{4} = 2.0 \times 10^{3}$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 20/420 = 48$ μg/m^3
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 48 = 720$ μg/l
$EPC_{WH2} = 13.8 \times 20 = 276$ μg/l
$EPC_{LH} = 0.2 \times 276 = 55$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l
$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A260
1,2-DICHLOROETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.0E4		48 (0.01)		
Water, $\mu g/l$ (ppm Wt)			3.0E5	1.0E4	276	5,000	
Land, $\mu g/g$ (ppm Wt)			6.0E4	2.0E3	55	1,000	

*To be multiplied by dilution factor

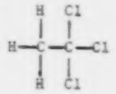
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			48 (0.01)		
Water, $\mu g/l$ (ppm Wt)			276	5,000	
Land, $\mu g/g$ (ppm Wt)			55	1,000	

CATEGORY: 2A

1,1,1-TRICHLOROETHANE: $C_2H_3Cl_3$. (Methyl chloroform, chlorothene, chlorten). 02A280.
A colorless, nonflammable liquid.

WLN: GXGG

STRUCTURE:



PROPERTIES:

Molecular wt: 133.41; mp: -30.41; bp: 74.1^{760}; d: 1.3390_{4}^{20}; vap. d: 4.6; vap. press: 127 mm Hg at 25°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 65 ppt (ref. 1) or 0.35 μg/m³. It has also been detected in samples taken from public drinking water supplies in 3 U.S. cities: Ottumwa, Iowa; Philadelphia, Pennsylvania; and Cincinnati, Ohio (ref. 11).

Trichloroethane is formed by the reaction of chlorine with 1,1-dichloroethane (ref. 2).

Trichloroethane is used in cold type metal cleaning, in plastic molds cleaning, and as a solvent (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Trichloroethane is narcotic in high concentrations (ref. 3). Recovery is rapid following exposure to anesthetic concentrations (ref. 21). Exposure to 5,000 ppm for 10 minutes has resulted in human death (ref. 4); central nervous system effects resulted from 920 ppm for 70 minutes (ref. 4). Concentrations as high as 500 ppm do not produce serious effects in humans. Drunkeness and loss of coordination occur at 2,000 ppm (ref. 21).

Trichloroethane is very stable in the body. A large portion of a dose injected intravenously is rapidly excreted by the lungs. A very small portion is metabolized to chloroethanol and excreted in the urine as glucoronate (ref. 21).

LD_{50} (oral, dog): 750 mg/kg

LC_{Lo} (inhalation, rat): 1,000 ppm (ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 535 mg/m³ (100 ppm).

Trichloroethane is on the EPA Consent Decree List, Priority 2.

1,1,1-Trichloroethane is subject of a NIOSH Criteria Document (ref. 29). The NIOSH recommendation for occupational exposure is 350 ppm as a 15 minute ceiling.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5.35×10^5 μg/m³ (100 ppm)

Water, Health: $15 \times 5.35 \times 10^5 = 8.03 \times 10^6$ μg/l

Land, Health: $0.2 \times 8.03 \times 10^6 = 1.61 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ μg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 535/420 = 1{,}274$ μg/m³

$EPC_{AH1a} = 100/420 = 0.2$ ppm

$EPC_{WH1} = 15 \times 1{,}274 = 1.91 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 535 = 7{,}383$ μg/l

$EPC_{LH} = 0.2 \times 7.383 = 1{,}477$ μg/g

$EPC_{WE1} = 50 \times 10 = 500$ μg/l

$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A280
1,1,1 TRICHLOROETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.4E5 (100)		1,274 (0.238)		0.35 (0.065)
Water, $\mu g/l$ (ppm Wt)			8.0E6	1.0E3	7,383	500	
Land, $\mu g/g$ (ppm Wt)			1.6E6	2.0E2	1,477	100	

*To be multiplied by dilution factor

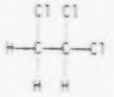
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,274 (0.238)		
Water, $\mu g/l$ (ppm Wt)			7,383	500	
Land, $\mu g/g$ (ppm Wt)			1,477	100	

CATEGORY: 2A

1,1,2-TRICHLOROETHANE: $C_2H_3Cl_3$. (β-Trichloroethane, vinyl trichloride). A colorless, nonflammable liquid with a pleasant odor. 02A290

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 133.42; mp: -36.7; bp: 113.5; d: 1.4416^{20}_{4}, vapor press: 25 mm Hg at 25°C; vapor d: 4.6; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,1,2-Trichloroethane has been detected in the public drinking water supply of Miami, Florida (ref. 11).

1,1,2-Trichloroethane has been used as a chemical intermediate and solvent for fats, waxes, natural resins, and alkaloids (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

1,1,2-Trichloroethane is narcotic in high concentrations (ref. 3). Toxicological responses include irritation of the eyes, nose, and lungs, depression of the central nervous system, and injury to the liver and kidneys. 1,1,2-Trichloroethane appears to be many times more toxic than its 1,1,1-isomer for acute exposure (ref. 21). Chronic studies indicate that the toxicological responses to 1,1,2-trichlorethane are similar to responses from carbon tetrachloride (ref. 21).

LD_{50} (oral, rat): 0.1-0.2 g/kg (ref. 19).

LC_{Lo} (inhalation, rat): 500 ppm (8 hr)(ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On EPA Consent Decree List, Priority 2.

TLV (skin): 54 mg/m^3 (10 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5.4×10^4 $\mu g/m^3$ (10 ppm)

Water, Health: $15 \times 5.4 \times 10^4 = 8.4 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 8.1 \times 10^5 = 1.6 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: 100 x 10 = 1,000 μg/ℓ

Land, Ecology: 0.2 x 1,000 = 200 μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 54/420 = 128\ \mu g/m^3$

$EPC_{AH1a} = 10/420 = 0.024$ ppm

$EPC_{WH1} = 15 \times 128 = 1,930$ μg/ℓ

$EPC_{WH2} = 13.8 \times 54 = 745$ μg/ℓ

$EPC_{LH} = 0.2 \times 745 = 149$ μg/g

$EPC_{WE1} = 50 \times 10 = 500$ μg/ℓ

$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A290
1,1,2-TRICHLOROETHANE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			5.4E4 (10)		128 (0.024)		
Water, μg/l (ppm Wt)			8.4E5	1.0E3	745	500	
Land, μg/g (ppm Wt)			1.6E5	2.0E2	149	100	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			128 (0.024)		
Water, μg/l (ppm Wt)			745	500	
Land, μg/g (ppm Wt)			149	100	

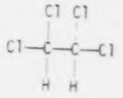
CATEGORY: 2A

1,1,2,2-TETRACHLOROETHANE: $C_2H_2Cl_4$. (Acetylene tetrachloride). 02A300

Heavy, odorless, mobile liquid with a chloroform-like odor.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 167.86; mp: -43.0; bp: 146.3; d: 1.600 at 20°/4°C; solubility in water: very slightly soluble.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The odor is detectable at 3 ppm (ref. 3).

1,1,2,2-Tetrachloroethane is used as a solvent for cleaning and extraction processes. It is also used as a chemical intermediate (ref. 21).

TOXIC PROPERTIES, HEALTH EFFECTS:

1,1,2,2-Tetrachloroethane is generally considered the most toxic of the common chlorinated hydrocarbons. The most significant toxic effects from chronic exposure to 1,1,2,2-tetrachloroethane include atrophy and cirrhosis of the liver (ref. 3). Ingestion of 30 mg/kg is reported to cause central nervous system effects in man (ref. 4).

LD_{Lo} (oral, dog): 700 mg/kg

LC_{Lo} (inhalation, rat): 1,000 ppm for 4 hours

The compound has recently been shown to be carcinogenic in mice (ref. 31).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

1,1,2,2-Tetrachloroethane appears on the EPA Consent Decree List with an assigned priority of 2.

TLV (skin): 35 mg/m^3 (5 ppm).

The compound is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 1 ppm or 7 mg/kg as a time-weighted average (ref. 32).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 7.0×10^3 μg/m^3 (1 ppm)

Water, Health: $15 \times 7.0 \times 10^3 = 1.05 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 1.05 \times 10^5 = 2.1 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 7 \times 10^3/420 = 17$ μg/m^3

$EPC_{AH1a} = 1/420 = 0.0024$ ppm

$EPC_{WH1} = 15 \times 17 = 255$ μg/ℓ

$EPC_{WH2} = 13.8 \times 17 = 97$ μg/ℓ

$EPC_{LH} = 0.2 \times 97 = 19$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A300
1,1,2,2-TETRACHLOROETHANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.0E3		17 (0.0024)		
Water, $\mu g/l$ (ppm Wt)			1.1E5		97		
Land, $\mu g/g$ (ppm Wt)			2.1E4		19		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			17 (0.0024)		
Water, $\mu g/l$ (ppm Wt)			97		
Land, $\mu g/g$ (ppm Wt)			19		

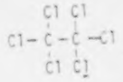
CATEGORY: 2A

HEXACHLOROETHANE: Cl_3CCCl_3 (perchloroethane, carbon hexachloride). 02A320

A colorless, nonflammable crystal with a camphoraceous odor. Readily sublimes without melting.

WLN: GXGGXGGG

STRUCTURE:



$$Cl-\underset{Cl}{\overset{Cl}{C}}-\underset{Cl}{\overset{Cl}{C}}-Cl$$

PROPERTIES:

Molecular wt: 236.74; mp: 186.8; bp: 186^{777}; d: 2.091_4^{20}; vap. d: 8.16; vap. press: 1 mm at 32.7°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Hexachloroethane has been detected in samples taken from public drinking water supplies in Miami, Florida at 0.5 μg/l (ref. 11).

It emits highly toxic fumes of phosgene when heated to 300-500°C (ref. 5). Also, dehalogenation by reaction with alkalides, metals, etc., will produce spontaneous explosive chloroacetylenes (ref. 3). It may be absorbed through the skin (ref. 5).

It is used as a solvent, in explosives, as camphor substitute in celluloid, as an insecticide, and as a parasiticide in animals (ref. 2,21).

TOXIC PROPERTIES, HEALTH EFFECTS:

Hexachloroethane may be moderately irritating to skin, and mucous membranes (ref. 2). Primary response is central nervous system depression. However, as the material is a solid and has a low vapor pressure, the hazard of breathing the vapor in industrial handling is relatively low (ref. 21). It may be absorbed through the skin (ref. 5).

LD_{Lo} (intravenous, dog): 325 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 10 mg/m^3 (1 ppm), (skin).

Hexachloroethane is on the EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	1.0×10^4 μg/m^3 (1 ppm)	Air, Ecology:
Water, Health:	$15 \times 1.0 \times 10^4 = 1.5 \times 10^5$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 1.5 \times 10^5 = 3.0 \times 10^4$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 10/420 = 23.8$ μg/m^3

$EPC_{AH1a} = 1/420 = 0.002$ ppm

$EPC_{WH1} = 15 \times 23.8 = 357$ μg/l

$EPC_{WH2} = 13.8 \times 10 = 138$ μg/l

$EPC_{LH} = 0.2 \times 138 = 27.6$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02A320
HEXACHLOROETHANE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E4		24 (0.002)		
Water, $\mu g/l$ (ppm Wt)			1.5E5		138		0.5
Land, $\mu g/g$ (ppm Wt)			3.0E4		28		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			24 (0.002)		
Water, $\mu g/l$ (ppm Wt)			138		
Land, $\mu g/g$ (ppm Wt)			28		

CATEGORY: 2A

WLN:

DICHLOROPROPANES: $C_3Cl_2H_6$ 02A340

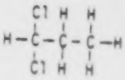
1,1-DICHLOROPROPANE: (propylidene dichloride, propylidene chloride). A liquid. 02A341

1,2-DICHLOROPROPANE: (propylene chloride, propylene dichloride). A colorless, flammable liquid; chloroform odor. 02A342

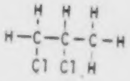
1,3-DICHLOROPROPANE: (trimethylene chloride). A colorless liquid. 02A343

2,2-DICHLOROPROPANE: (acetone dichloride, isopropylidene chloride). A liquid. 02A344

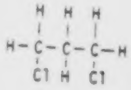
STRUCTURE:



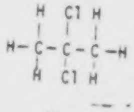
02A341



02A342



02A343



02A344

PROPERTIES:

	mol. wt.	bp	mp	d	solubility in water	vap. press	vap. d
1,1-dichloropropane	112.99	88.1		1.132	slightly		
1,2-dichloropropane	112.99	96.4	-100.4	1.156	slightly	40 mm at 19.4°	3.9
1,3-dichloropropane	112.99	120.4	- 99.5	1.188	slightly		3.9
2,2-dichloropropane	112.99	69.3	- 33.8	1.112	insoluble		3.9

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,2-Dichloropropane is used as an oil and fat solvent, in dry cleaning fluids, in degreasing, and in insecticidal fumigant mixtures (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

1,2-Dichloropropane may produce narcosis in high concentrations (ref. 2). Chronic exposure may result in injury to liver and kidney (ref. 21). Animal toxicity data are given below (ref. 4).

	LD_{50} (oral, rat)	LC_{Lo} (inhalation, rat)	LD_{Lo} (oral, dog)	Aquatic Toxicity TLm 96:
1,1-dichloropropane	6,500 mg/kg	4,000 ppm/4H		
1,2-dichloropropane	1,900 mg/kg	2,000 ppm/4H	5,000 mg/kg	100-10 ppm
1,3-dichloropropane			3,000 mg/kg	

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 350 mg/m^3 (75 ppm) for 1,2-dichloropropane.

1,2-Dichloropropane is the the EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.5×10^5 μg/m^3 (75 ppm)

Water, Health: $15 \times 3.5 \times 10^5 = 5.25 \times 10^6$ μg/l

Land, Health: $0.2 \times 5.25 \times 10^6 = 1.05 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ μg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ μg/l

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 350/420 = 833$ μg/m^3

$EPC_{AH1a} = 75/420 = 0.18$ μg/m^3

$EPC_{WH1} = 15 \times 833 = 1.25 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 350 = 4{,}830$ μg/l

$EPC_{LH} = 0.2 \times 4{,}830 = 966$ μg/g

$EPC_{WE1} = 50 \times 10 = 500$ μg/l

$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

02A340
DICHLOROPROPANES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.5E5 (75)		833 (0.18)		
Water, μg/l (ppm Wt)			5.25E6	1.0E3	4,830	500	
Land, μg/g (ppm Wt)			1.0E6	2.0E2	966	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			833 (0.18)		
Water, μg/l (ppm Wt)			4,830	500	
Land, μg/g (ppm Wt)			966	100	

CATEGORY: 2A

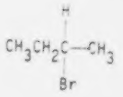
WLN:

BROMOBUTANES: C_4H_9Br 02A360
1-BROMOBUTANE: (n-butylbromide). A colorless, flammable liquid. 02A361
2-BROMOBUTANE: (sec-butylbromide, methylethylbromoethane). A colorless liquid with a pleasant odor. 02A362
2-BROMOISOBUTANE: (tert-butylbromide, 2-bromo-2-methylpropane, trimethylbromomethane). A colorless liquid. 02A363

STRUCTURE:

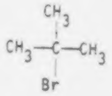
$CH_3CH_2CH_2CH_2Br$

(1-bromobutane)



$CH_3CH_2CH(Br)CH_3$

(2-bromobutane)



$(CH_3)_3CBr$

(2-bromoisobutane)

PROPERTIES:

	mol. wt.	bp	mp	d	Solubility in water	vap. d.
1-bromobutane	137.03	101.6	-112.4	1.276	insoluble	4.72
2-bromobutane	137.03	91.2	-119.0	1.256	insoluble	
2-bromoisobutane	137.03	73.3	-16.2	1.221		

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

At 210° C, 2-bromoisobutane changes to isobutyl bromide (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Bromobutanes may produce narcosis in high concentrations (ref. 2)
LD_{50} (intraperitoneal, rat): 1,250 mg/kg for 2-bromoisobutane (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1{,}250 = 5.63 \times 10^4$ μg/m^3

Water, Health: $15 \times 5.63 \times 10^4 = 8.45 \times 10^5$ μg/l

Land, Health: $0.2 \times 8.45 \times 10^5 = 1.69 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}250 = 133.8$ μg/m^3

$EPC_{AH3} = 0.081 \times 1{,}250 = 101$ μg/m^3

$EPC_{WH1} = 15 \times 101 = 1{,}515$ μg/l

$EPC_{WH2} = 0.4 \times 1{,}250 = 500$ μg/l

$EPC_{LH} = 0.2 \times 500 = 100$ μg/l

MULTIMEDIA ENVIRONMENTAL GOALS

02A360 BROMOBUTANES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.63E4		101		
Water, $\mu g/l$ (ppm Wt)			8.45E5		500		
Land, $\mu g/g$ (ppm Wt)			1.69E5		100		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			101		
Water, $\mu g/l$ (ppm Wt)			500		
Land, $\mu g/g$ (ppm Wt)			100		

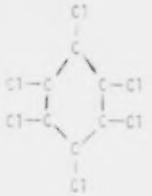
CATEGORY: 2A

HEXACHLOROCYCLOHEXANE: $C_6H_6Cl_6$ (Lindane, benzene-trans-hexachloride, 1α,2α,3β,4α,5α,6β-hexachlorocyclohexane, γ-benzene hexachloride). 02A380

A white crystalline powder with a musty odor.

WLN: L6TJ AG BG CG DG EG FG (GAMMA 2)

STRUCTURE:



PROPERTIES:

Molecular wt: 290.83; mp: 159.5-60; bp: 288; d: 1.87; vap. press: 0.14 mm; Hg at 40° (γ isomer); insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

There are 8 stereo isomers; the gamma (γ) isomer is the effective insecticide (ref. 2). Lindane, the γ-isomer, has been in samples taken from public drinking water supplies at 0.01 μg/l (ref. 11), in ground water (ref. 23), and in U.S. surface water at 0.02 μg/l (ref. 24). Lindane has also been reported in soils at 0.001 to 0.35 ppm (ref. 24), human milk at 0.001 to 0.35 ppm (ref. 24), fish at 0.01 to 4.37 ppm (total BHC)(ref. 24).

Lindane has been approved in the U.S. for 62 agricultural crops, with tolerances for residues on raw agricultural commodities set at 1 ppm (1-3 ppm lindane)(ref. 24).

In 1970, the total dietary intake of lindane was 1 μg/man/day (ref. 24).

Lindane is used in insecticides for crops, farm animals, and empty grain bins. A small amount of Lindane is believed to be used in human medicine as a scabicide (ref. 24).

BHC and Lindane can be detected with gas chromatography.

Heat causes some splitting of the molecule into phosgene fumes (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Different forms of BHC exhibit different toxicities. The β-isomer gives highest chronic toxicity and lowest acute toxicity. The α- and γ-isomers are central nervous system stimulants, and the β- and δ-isomers are depressants of the CNS (ref. 3).

Poisoning may occur by ingestion, inhalation, or percutaneous absorption (ref. 2). Either Lindane or the technical BHC may be absorbed from the GI tract (ref. 25). There are no human chronic studies (ref. 3). Hepatic damage has occurred in experimental animals (ref. 2).

Highest Lindane dosage not evoking demonstrable effect is 0.3 mg/kg of body weight per day for the dog (ref. 26).

Hexachlorocyclohexane has been reported to result in the death of a child who ingested 180 mg/kg and the death of a human adult who ingested 840 mg/kg (ref. 4)

LD_{50} (oral, rat): 88 mg/kg (ref. 4).

Hexachlorocyclohexane has been reported to cause cancer in mice when administered orally in large doses (ref. 24). The EPA/NIOSH ordering number is 3,111. The lowest reported dosage producing an oncogenic response is 29 g/kg. The adjusted ordering number is 0.11.

Aquatic toxicity: TLm 96: <1 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.5 mg/m^3 (4.0×10^{-5} ppm) for Lindane.

EPA 1976 Water Quality Criteria for lindane (ref 26) are as follows:

Domestic water supply (health):	4.0 μg/l
Freshwater aquatic life:	0.01 μg/l
Marine aquatic life:	0.004 μg/l

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 0.5 = 500\ \mu g/m^3$ (4.0×10^{-5} ppm) Air, Ecology:

Water, Health: $5 \times 4.0 = 20\ \mu g/l$

Land, Health: $0.2 \times 20 = 4\ \mu g/g$

Water, Ecology: $5 \times 0.004 = 0.02\ \mu g/l$

Land, Ecology: $0.2 \times 0.02 = 4.0 \times 10^{-3}\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.5/420 = 1.19\ \mu g/m^3$

$EPC_{AH1a} = 4.0 \times 10^{-5}/420 = 9.5 \times 10^{-8}$

$EPC_{WHS} = 4.0\ \mu g/l$

$EPC_{LH} = 0.2 \times 4 = 0.8\ \mu g/g$

$EPC_{WES} = 0.004\ \mu g/l$

$EPC_{LE} = 0.2 \times 0.004 = 8 \times 10^{-4}\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

02A380
HEXACHLOROCYCLOHEXANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E2 (4.0E-5)		1.19 (9.5×10^{-8})		
Water, $\mu g/l$ (ppm Wt)			2.0E1	2.0E-2	4.0	0.004	0.01
Land, $\mu g/g$ (ppm Wt)			4.0E0	4.0E-3	0.8	0.0008	0.001

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1.19 (9.5×10^{-8})		
Water, $\mu g/l$ (ppm Wt)	4.0	0.004			
Land, $\mu g/g$ (ppm Wt)			0.8	0.0008	

CATEGORY: 2A

1-CHLOROOCTANE: $C_8H_{17}Cl$. 02A400

A liquid.

WLN:

STRUCTURE:

$CH_3—(CH_2)_6—CH_2Cl$

PROPERTIES:

Molecular wt: 148.68; mp: -57.8; bp: 182^{760};

d: 0.8738^{20}_{4}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 1-chlorooctane are not available at this time.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

02A400
1-CHLOROOCTANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)							
Water, μg/l (ppm Wt)							
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)					
Water, μg/l (ppm Wt)					
Land, μg/g (ppm Wt)					

REFERENCES: CATEGORY 2A

Alkyl Halides - Saturated Alkyl Halides

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REFERENCES: CATEGORY 2A (Continued)

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CATEGORY 2

ALKYL HALIDES

SUBCATEGORY: 2B - Unsaturated Alkyl Halides

Summary of Subcategory

Total number of compounds in subcategory	15
number of parent compounds with subspecies	2
number of subspecies	8
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	1

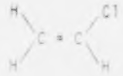
Consent Decree compounds included in subcategory: 15

02B020	Vinyl chloride (Chloroethylene)
02B041	cis-1,2-Dichloroethene
02B042	trans-1,2-Dichloroethene
02B060	1,1-Dichloroethene
02B070	Trichloroethylene
02B080	Tetrachloroethene
02B090	1,1-Dichloro-2,2-difluoroethylene
02B101	1,1-Dichloropropene
02B102	trans-1,2-Dichloropropene
02B103	cis-1,3-Dichloropropene
02B104	trans-1,3-Dichloropropene
02B105	2,3-Dichloropropene
02B106	3,3-Dichloropropene
02B120	Hexachlorobutadiene
02B140	Hexachlorocyclopentadiene

CATEGORY: 2B

WLN: G1U1

STRUCTURE:



VINYL CHLORIDE: CH_2CHCl (chloroethene, chloroethylene).
A colorless liquid or gas. 02B020

PROPERTIES:

Molecular wt: 62.50; mp: -153.8; bp: -13.37; d: 0.9106^{15}_{4}; vap. d: 2.15; vap. press: 2,600 mm at 25° C; slightly soluble; flammable.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Vinyl chloride polymerizes in light or in presence of a catalyst. It releases phosgene and hydrogen chloride when heated to decomposition.

The concentration of vinyl chloride in rural atmosphere is reported at < 5 ppt (ref. 1). This is equivalent to < 0.005 ppb or < 0.013 µg/m^3.

Vinyl chloride has been identified in samples of public drinking water supplies in concentrations of 10 µg/ℓ (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Vinyl chloride acts as an anesthetic at high concentrations. There is a wide margin between the anesthetic and lethal concentrations (ref. 3). Circulatory and bone changes in the fingertips of workers handling vinyl chloride are reported (ref. 4). Vinyl chloride has been associated with a rare form of liver cancer.

It has produced tumors in rats, hamsters, mice and in man (ref. 13). The EPA/NIOSH ordering number is 7425 with the lowest effective dosage reported as 250 ppm administered for 4 hr/day for 260 days to a rat. Assuming total absorption of material in the air breathed, breathing volume of 0.73 ℓ/min and weight of rat as 0.113 kg (ref.5), the dosage corresponds to 25.6 g/kg. The adjusted ordering number calculated using this number is extremely small. Since cancer in humans has been associated with vinyl chloride, further study is warranted for determining a permissible concentration. Occupational exposures resulting in angiosarcoma have generally been in excess of 200 ppm as a time-weighted exposure (ref. 13).

Aquatic toxicity: TLm 96: Over 1,000 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 510 mg/m^3 (200 ppm). (Vinyl chloride is classified by ACGIH as a human carcinogen. Reassignment of TLV is pending further data acquisition.)

National Emission Standards for Hazardous Air Pollutants include standards of emissions of vinyl chloride from vinyl chloride manufacturers or polyvinyl chloride manufacturers (ref. 7)..

OSHA Standard for Exposure to Vinyl Chloride: 1 ppm 8 hr/day time-weighted exposure (ref. 8). 1 ppm is equivalent to 2.55 mg/m^3. Carcinogenicity of vinyl chloride is considered.

NIOSH recommended standard for occupational exposure in polymerization facilities is to eliminate exposure at detectable levels (ref. 9). EPA Consent Decree Priority 1 List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.55×10^3 µg/m^3
Water, Health: $15 \times 2.55 \times 10^3 = 3.8 \times 10^4$ µg/ℓ
Land, Health: $0.2 \times 3.8 \times 10^4 = 7.7 \times 10^3$ µg/g

Air, Ecology:
Water, Ecology: $100 \times 1{,}000 = 1.0 \times 10^5$ µg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 510/420 = 1{,}200$ µg/m^3
$EPC_{AH1a} = 200/420 = 0.5$ ppm
$EPC_{WH1} = 15 \times 1{,}200 = 18{,}000$ µg/ℓ
$EPC_{WH2} = 13.8 \times 510 = 7{,}040$ µg/ℓ
$EPC_{LH} = 0.2 \times 7{,}038 = 1{,}408$ µg/g
$EPC_{AC1} = 10^3 \times 2.55/420 = 6$ µg/m^3
$EPC_{AC1a} = 1/420 = 0.002$ ppm
$EPC_{WC} = 15 \times 6 = 90$ µg/ℓ
$EPC_{LC} = 0.2 \times 90 = 18$ µg/g

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000$ µg/ℓ
$EPC_{LE} = 0.2 \times >50{,}000 = >1.0 \times 10^4$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X

02B020
VINYL CHLORIDE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.55E3		6 (0.002)		<0.01
Water, $\mu g/l$ (ppm Wt)			3.8E4	1.0E5	90	50,000	<10+
Land, $\mu g/g$ (ppm Wt)			7.7E3	2.0E4	18	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,200 (0.5)		6 (0.002)
Water, $\mu g/l$ (ppm Wt)			7,040	>50,000	90
Land, $\mu g/g$ (ppm Wt)			1,408	10,000	18

+Public drinking water.

CATEGORY: 2B

1,2-DICHLOROETHENE: $C_2H_2Cl_2$ (dichloroethylene, acetylene dichloride). 02B040.

cis-1,2-DICHLOROETHENE: A colorless liquid with a pleasant odor. 02B041

trans-1,2-DICHLOROETHENE: A colorless liquid with a pleasant odor. 02B042

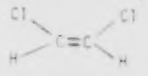
PROPERTIES:

cis-1,2-dichloroethene: mol. wt: 96.94; mp: -80.5; bp: 60.3^{760}; d: 1.2837_4^{20}; vap. d: 3.34; vap. press: 400 mm at 41°; slightly soluble in water.

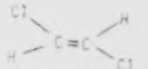
trans-1,2-dichloroethene: mol. wt: 96.94; mp: -50; bp: 47.5^{760}; d: 1.2565; vap. d: 3.34; vap. press: 400 mm at 30.8°; slightly soluble in water.

WLN: G1U1G

STRUCTURE:



cis-1,2-Dichloroethene



trans-1,2-Dichloroethene

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cis-1,2-Dichloroethene has been reported in samples taken from drinking water supplies in Miami, Florida at 16 μg/l; it has also been found in Philadelphia, Pennsylvania, and in Cincinnati, Ohio. Also, trans-1,2-dichloroethene has been found in public drinking water supplies in Miami, Florida at 1 μg/l (ref. 2).

Both cis- and trans-1,2-dichloroethene are used in solvents and as chemical intermediates (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

The major response to both cis- and trans-1,2-dichloroethene is central nervous system depression (ref. 10). Exposure to 3,300 mg/m^3 of the trans-isomer via inhalation has resulted in toxic effects to humans (ref. 6). Regarding acute exposure, the trans-isomer is twice as toxic and anaesthetic as the cis-isomer. Regarding chronic exposure, the cis-isomer is reported to cause injury to lungs, liver, kidney; the trans-isomer has demonstrated no injury (ref. 10).

LD_{50} (oral, rat): 770 mg/kg for the cis-isomer (ref. 6).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 790 mg/m^3 (200 ppm).

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 7.9×10^5 μg/m^3 (200 ppm)

Water, Health: $15 \times 7.9 \times 10^5 = 1.19 \times 10^7$ μg/l

Land, Health: $0.2 \times 1.19 \times 10^7 = 2.37 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 790/420 = 1{,}881$ μg/m^3

$EPC_{AH1a} = 200/420 = 0.48$ ppm

$EPC_{WH1} = 15 \times 1{,}881 = 28{,}300$ μg/l

$EPC_{WH2} = 13.8 \times 790 = 10{,}900$ μg/l

$EPC_{LH} = 0.2 \times 1.09 \times 10^4 = 2{,}180$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02B040
1,2-DICHLOROETHENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.9E5 (200)		1,880		
Water, $\mu g/l$ (ppm Wt)			1.19E7	1.0E4	10,900	5,000	1[+]
Land, $\mu g/g$ (ppm Wt)			2.37E6	2.0E3	2,180	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,880		
Water, $\mu g/l$ (ppm Wt)			10,900	5,000	
Land, $\mu g/g$ (ppm Wt)			2,180	1,000	

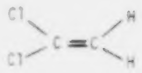
[+] Public Drinking Water

CATEGORY: 2B

1,1-DICHLOROETHENE: CH_2CCl_2 (vinylidene chloride, 1,1-dichloroethylene). 02B060
A colorless liquid with a mild, sweet odor resembling chloroform.

WLN: GYGU1

STRUCTURE:



PROPERTIES:
Molecular wt: 96.94; mp: -122.1; bp: 37^{760}; d: 1.218; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as <5 ppt (ref. 1), or <0.02 $\mu g/m^3$. 1,1-Dichloroethene has been reported in samples taken from public drinking water supplies in two U.S. cities at 0.1 $\mu g/l$; it was also identified in samples from two other cities (ref. 2).

1,1-Dichloroethene is used in the production of vinylidene polymer plastics such as Velon and Saran (ref. 11).

1,1-Dichloroethene is prepared from ethylene chloride or by dehydrochlorination of 1,1,2-Trichloroethane (ref. 11).

Threshold for odor detection is 1,000 ppm in air; some can sense it at 500 ppm (ref. 10).

In the presence of air or oxygen, with the inhibitor removed, 1,1-dichloroethene forms a complex peroxide compound at temperatures as low as -40° C. The peroxide is violently explosive. Reaction products formed with ozone are particularly dangerous (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

1,1-Dichloroethene may produce narcosis in high concentrations. Liver and kidney injury were reported in experimental animals (ref. 11).

Animal studies indicate that the maximum single exposure permitting a reasonably high probability of no injuries is above 1,000 ppm for up to 1 hour and 260 ppm for up to 8 hours (ref. 10).

LD_{Lo} (oral, dog): 5,750 mg/kg (ref. 6).
LC_{Lo} (inhalation, rat): 10,000 ppm/24 hours (ref. 6).
Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 40 mg/m^3 (10 ppm).
On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $4.0 \times 10^4\ \mu g/m^3$ (10 ppm)
Water, Health: $15 \times 4.0 \times 10^4 = 6 \times 10^5\ \mu g/l$
Land, Health: $0.2 \times 6 \times 10^5 = 1.2 \times 10^5\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/l$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 40/420 = 95.2\ \mu g/m^3$
$EPC_{AH1a} = 10/420 = 0.024$ ppm
$EPC_{WH1} = 15 \times 95.2 = 1{,}428\ \mu g/l$
$EPC_{WH2} = 13.8 \times 40 = 552\ \mu g/l$
$EPC_{LH} = 0.2 \times 552 = 110.4\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5{,}000\ \mu g/l$
$EPC_{LE} = 0.2 \times 5{,}000 = 1.0 \times 10^3$

MULTIMEDIA ENVIRONMENTAL GOALS

02B060
1,1-DICHLOROETHENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			4.0E4 (10)		95 (0.024)		<0.02 (<0.005)
Water, μg/l (ppm Wt)			6.0E5	1.0E4	550	5,000	0.1†
Land, μg/g (ppm Wt)			1.2E5	2.0E3	110	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			95 (0.024)		
Water, μg/l (ppm Wt)			550	5,000	
Land, μg/g (ppm Wt)			110	1,000	

† Public Drinking Water.

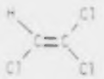
CATEGORY: 2B

TRICHLOROETHYLENE: C_2HCl_3 (ethylenetrichloride). 028070

A colorless, heavy mobile liquid; chloroform-like odor.

WLN: GYGU1G

STRUCTURE:



PROPERTIES:

Molecular wt: 131.40; mp: -73; fp: -86.6; bp: 86.7; d: 1.4649_4^{20}; vap. d: 4.53; vap. press: 100 mm at 32°C; practically insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Trichloroethylene together with tetrachloroethylene has been identified at concentrations of 28 ppt (0.028 ppb) or 0.15 μg/m^3 (ref. 1)

The odor recognition level is reported between 110 and 440 mg/m^3 (19.8-79.2 ppm)(ref. 15).

Trichloroethylene is used as a solvent and for degreasing in dry cleaning. It is also used in the manufacture of organic chemicals (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

Acute narcosis may result from exposure to trichloroethylene. Some studies indicate chronic effects as well (ref. 3).

Ingestion of 857 mg/kg of trichloroethylene has resulted in human death (ref. 6). Inhalation of 160 ppm for 83 minutes has produced central nervous system effects in man (ref. 6). Eye irritation also results at 160 ppm (ref. 15).

LD_{50} (oral, rat): 4920 mg/kg (ref. 6).

LC_{Lo} (inhalation, rat): 8,000 ppm for 4 hours; (mouse): 3,000 ppm for 2 hours (ref. 6).

Trichloroethylene has produced carcinogenic responses in mice when administered orally at 135 g/kg. The EPA/NIOSH ordering number is 3111 and the adjusted ordering number is 0.002.

Aquatic toxicity: 96-hour TLm = 1000-100 ppm (ref. 6).

Toxicity to vegetation: Chlorophyll containing algae and plants are decolored at 600 mg/ℓ (ref. 15).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 535 mg/m^3 (100 ppm)

Trichloroethylene is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 100 ppm or 535 mg/m^3 as an 8-hour time-weighted average (ref. 14).

On EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5.35×10^5 μg/m^3 (100 ppm)

Water, Health: $15 \times 5.35 \times 10^5 = 8 \times 10^6$ μg/ℓ

Land, Health: $0.2 \times 8 \times 10^6 = 1.6 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 535/420 = 1,274$ μg/m^3

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 1,274 = 19,100$ μg/ℓ

$EPC_{WH2} = 13.8 \times 535 = 7,383$ μg/ℓ

$EPC_{LH} = 0.2 \times 7,383 = 1,477$ μg/g

$EPC_{WE1} = 50 \times 100 = 5,000$ μg/ℓ

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02B070
TRICHLOROETHYLENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.35E5		1,274		
Water, $\mu g/l$ (ppm Wt)			8.0E6	1.0E4	7,383	5,000	
Land, $\mu g/g$ (ppm Wt)			1.6E6	2.0E3	1,477	1,000	

*To be multiplied by dilution factor

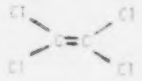
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,274		
Water, $\mu g/l$ (ppm Wt)			7,383	5,000	
Land, $\mu g/g$ (ppm Wt)			1,477	1,000	

CATEGORY: 2B

TETRACHLOROETHENE: Cl_2CCCl_2 (perchloroethylene, ethylene tetracnloride, tetrachloroethylene, carbon dichloride, carbon bichloride). 028080
A colorless, nonflammable liquid, with an ethereal odor.

WLN: GYGUYGG

STRUCTURE:



PROPERTIES:

Molecular wt: 165.83; mp: -19; bp: 121^{760}; d: 1.6227^{20}_{4}; vap. d: 5.83; vap. press: 15.8 mm Hg at 22°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 28 ppt (ref. 1), or 0.19 $\mu g/m^3$. Tetrachloroethene has also been reported in samples taken from public drinking water supplies in 8 U.S. cities, with the highest concentrations being 0.46 μg/l (ref. 2).

Threshold odor is reported as 50 ppm (ref. 10).

Tetrachloroethene is used in dry cleaning, degreasing metals, as a solvent, as an anthelminthic in humans and animals, and as a chemical intermediate (refs. 10,11).

Tetrachloroethene is produced by catalytic chlorination of acetylene (ref. 11). It is very stable and resists hydrolysis (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

Tetrachloroethene may produce narcosis in high concentrations. It has a defatting action on the skin and can lead to dermatitis (ref. 11).

Tetrachloroethene is readily adsorbed by the lungs when breathed as a vapor. It is partly excreted by the lungs, but some may be converted to a water-soluble metabolite (ref. 10).

Liver disfunction was reported for 7 workers exposed to 232-385 ppm (ref. 10).
LD_{50} (oral, mouse): 8.85 g/kg (ref. 11).
LC_{Lo} (inhalation, rat): 4,000 ppm/4 hours (ref. 6).
Aquatic toxicity: TLm 96: 100-10 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 670 mg/m^3 (100 ppm).

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 6.7×10^5 $\mu g/m^3$ (100 ppm)

Water, Health: $15 \times 6.7 \times 10^5 = 1.0 \times 10^7$ μg/l

Land, Health: $0.2 \times 1.0 \times 10^7 = 2.0 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ μg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 670/420 = 1{,}595\ \mu g/m^3$

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 1{,}595 = 2.39 \times 10^4\ \mu g/l$

$EPC_{WH2} = 13.8 \times 670 = 9{,}246\ \mu g/l$

$EPC_{LH} = 0.2 \times 9{,}246 = 1{,}849\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/l$

$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02B080
TETRACHLORETHENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			6.7E5 (100)		1,595 (0.24)		0.19 (0.028)
Water, μg/l (ppm Wt)			1.0E7	1.0E3	9,246	500	0.46$^+$
Land, μg/g (ppm Wt)			2.0E6	2.0E2	1,849	100	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			1,595 (0.24)		
Water, μg/l (ppm Wt)			9,246	500	
Land, μg/g (ppm Wt)			1,849	100	

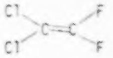
$^+$Public drinking water supplies.

CATEGORY: 2B

1,1-DICHLORO-2,2-DIFLUOROETHYLENE: $C_2Cl_2F_2$
(1,1-difluoro-2,2-dichloroethylene, 1,1-dichloro-2,2-difluoroethene). 02B090
A liquid.

WLN: GXGUYFF

STRUCTURE:



PROPERTIES:

Molecular wt: 132.93; vap. d: 4.6.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

When heated to decomposition, it emits highly toxic fumes of fluorides and chlorides. It reacts with water and steam to produce corrosive fumes (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

LC_{Lo} (inhalation, rat): 1,000 ppm/4H.
1000 ppm = 4610 mg/m^3.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$100 \times 4610 = 4.6 \times 10^5$ $\mu g/m^3$	Air, Ecology:
Water, Health:	$15 \times 4.6 \times 10^5 = 6.9 \times 10^6$ $\mu g/l$	Water, Ecology:
Land, Health:	$0.2 \times 6.9 \times 10^6 = 1.4 \times 10^6$ $\mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

02B090

1,1-DICHLORO-2,2-DIFLUOROETHYLENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			4.6E5				
Water, μg/l (ppm Wt)			6.9E6				
Land, μg/g (ppm Wt)			1.4E6				

*To be multiplied by dilution factor

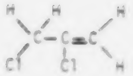
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)					
Water, μg/l (ppm Wt)					
Land, μg/g (ppm Wt)					

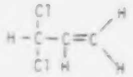
CATEGORY: 2B

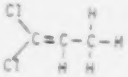
WLN:

DICHLOROPROPENES: $C_3H_4Cl_2$ 02B100
1,1-DICHLOROPROPENE: A liquid. 02B101
trans-1,2-DICHLOROPROPENE: (1,2-dichloropropylene). A colorless liquid. 02B102
cis-1,3-DICHLOROPROPENE: (1,3-dichloropropylene, telone, α-chloroallychloride, α,γ-dichloropropylene). A liquid, with chloroform-like odor. 02B103
trans-1,3-DICHLOROPROPENE: 02B104
2,3-DICHLOROPROPENE: A liquid 02B105
3,3-DICHLOROPROPENE: (acrolein dichloride). A liquid. 02B106

STRUCTURE:


02B105


02B106

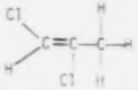

02B101

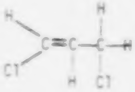
PROPERTIES:

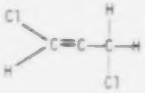
	mol. wt.	bp.	d	vap. d.	solubility in water
1,1-dichloropropene:	110.97	76-77	1.1864		insoluble
trans-1,2-dichloropropene:	110.97	77.0	1.1818	3.83	insoluble
cis-1,3-dichloropropene:	110.97	104.3	1.217	3.8	insoluble
trans-1,3-dichloropropene:	110.97	112	1.224	3.8	insoluble
2,3-dichloropropene:	110.97	94	1.211		insoluble
3,3-dichloropropene:	110.97	84.4	1.175		insoluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,3-Dichloropropene (cis- and trans-isomers) are used together with 1,2-dichloropropene in the DD mixture as a soil fumigant for control of nematodes affecting roots of plants (ref. 11).


02B102


02B103


02B104

TOXIC PROPERTIES, HEALTH EFFECTS:

1,3-Dichloropropene (cis- and trans-isomers) is a strong irritant. It has produced liver and kidney injury in experimental animals (ref. 4). It is irritating to skin, eyes, and mucous membranes (ref. 11).

	LD_{50} (oral, rat)mg/kg (ref. 6)	LC_{Lo} (inhalation, rat) (ref. 6)	Aquatic toxicity TLm 96: (ref. 6)
1,3-dichloropropene	250		100-10 ppm
Mixture	250	250 ppm	
2,3-dichloropropene	320	500 ppm/4 hours	

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 250 = 1.13 \times 10^4$ μg/m³
Water, Health: $15 \times 1.13 \times 10^4 = 1.7 \times 10^5$ μg/l
Land, Health: $0.2 \times 1.7 \times 10^5 = 3.4 \times 10^4$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 10 = 1,000$ μg/l
Land, Ecology: $0.2 \times 1,000 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 0.107 \times 250 = 26.75$ μg/m³
$EPC_{AH1a} = 0.081 \times 250 = 20$ μg/m³
$EPC_{WH1} = 15 \times 20 = 303$ μg/l
$EPC_{WH2} = 0.4 \times 250 = 100$ μg/l
$EPC_{LH} = 0.2 \times 100 = 20$ μg/g

$EPC_{WE} = 50 \times 10 = 500$ μg/l
$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

02B100
DICHLOROPROPENES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.13E4		20		
Water, $\mu g/l$ (ppm Wt)			1.7E5	1.0E3	100	500	
Land, $\mu g/g$ (ppm Wt)			3.4E4	2.0E2	20	100	

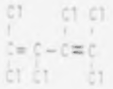
*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			20		
Water, $\mu g/l$ (ppm Wt)			100	500	
Land, $\mu g/g$ (ppm Wt)			20	100	

CATEGORY: 2B
HEXACHLOROBUTADIENE: C_4Cl_6 028120
(hexachloro-1,3-butadiene).
A liquid.

WLN:

STRUCTURE:



$$\begin{array}{cccc} Cl & & Cl & Cl \\ | & & | & | \\ C= & C- & C= & C \\ | & | & & | \\ Cl & Cl & & Cl \end{array}$$

PROPERTIES:

Molecular wt: 260.76; mp: -21, bp: 215^{760}; d. 1.6820^{20}_{4};
insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Hexachlorobutadiene has been identified in samples taken from public drinking water supplies at a level of 0.01 μg/l (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 90 mg/kg (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

On EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 90 = 4{,}050\ \mu g/m^3$

Water, Health: $15 \times 4{,}050 = 6.08 \times 10^4\ \mu g/l$

Land, Health: $0.2 \times 6.08 \times 10^4 = 1.22 \times 10^4\ \mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 90 = 9.63\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 90 = 7.29\ \mu g/m^3$

$EPC_{WH1} = 15 \times 7.29 = 109.4\ \mu g/l$

$EPC_{WH2} = 0.4 \times 90 = 36\ \mu g/l$

$EPC_{LH} = 0.2 \times 36 = 7.2\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

02B120 HEXACHLOROBUTADIENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.05E3		7		
Water, $\mu g/l$ (ppm Wt)			6.08E4		36		0.01+
Land, $\mu g/g$ (ppm Wt)			1.2 E4		7		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			7		
Water, $\mu g/l$ (ppm Wt)			36		
Land, $\mu g/g$ (ppm Wt)			7		

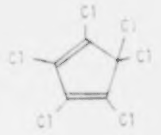
+Public drinking water supplies.

CATEGORY: 2B

HEXACHLOROCYCLOPENTADIENE: C_5Cl_6 02B140
(perchlorocyclopentadiene, C-56).
A yellow liquid, with a pungent odor.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 272.77; mp: -9; bp: 239^{753}; d: 1.7019^{25}_{4}, vap. d: 9.42; vap. press: 0.080 mm Hg at 25°.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Used as a chemical intermediate in the manufacture of aldrin (ref. 12).
Odor threshold is 0.15 ppm by volume in air (ref. 12).

TOXIC PROPERTIES, HEALTH EFFECTS:

Exposure to hexachlorocyclopentadiene has been reported to produce degenerative changes in the heart, brain, adrenal glands, liver, and kidney. Severe pulmonary hyperemia and edema have resulted from breathing contaminated air (ref. 12).

The lack of significant ill effects on humans is due to the highly irritating nature of the compound which makes prolonged exposure intolerable (ref. 3).

LD_{50} (oral, rat): 113 mg/kg (ref. 6).

Readily absorbed through intact skin (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.11 $\mu g/m^3$ (0.01 ppm).

On EPA Consent Decree List, Priority 3.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 110 $\mu g/m^3$ (0.01 ppm)

Water, Health: 15 x 110 = 1,650 μg/l

Land, Health: 0.2 x 1,650 = 330 μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.11/420 = 0.26\ \mu g/m^3$

$EPC_{AH1a} = 0.01/420 = 2.4 \times 10^{-5}$ ppm

$EPC_{WH1} = 15 \times 0.26 = 3.9\ \mu g/l$

$EPC_{WH2} = 13.8 \times 0.11 = 1.52\ \mu g/l$

$EPC_{LH} = 0.2 \times 1.52 = 0.30\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

02B140

HEXACHLOROCYCLOPENTADIENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.1E2 (0.01)		0.26 (2.4×10^{-5})		
Water, $\mu g/l$ (ppm Wt)			1.65E3		1.5		
Land, $\mu g/g$ (ppm Wt)			3.3E2		0.3		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			0.26 (2.4×10^{-5})		
Water, $\mu g/l$ (ppm Wt)			1.5		
Land, $\mu g/g$ (ppm Wt)			0.3		

REFERENCES: CATEGORY 2B

Alkyl Halides - Unsaturated Alkyl Halides

1. Wagoner, D. Compilation of Ambient Trace Substances. Draft of Report Prepared by Research Triangle Institute Under Contract No. 68-02-1325 for U.S. Environmental Protection Agency. Available from W. G. Tucker, Project Officer, IERL-EPA, Research Triangle Park, N.C. (1976).

2. U.S. Environmental Protection Agency, Office of Toxic Substances. Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress. Environmental Protection Agency, Washington, DC (1975).

3. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

4. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

5. Bond, R. G., C. P. Straub, and R. Prober, Eds. Handbook of Environmental Control. Vol. 1: Air Pollution. The Chemical Rubber Co., Cleveland, OH (1972).

6. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

7. U.S. Environmental Protection Agency. National Emission Standards for Hazardous Air Pollutants. Title 40 Code Federal Regulations, Part 61.

8. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29 Code Federal Regulations, Part 1910.

9. National Institute for Occupational Safety and Health. Recommended Standard for Occupational Exposure to Vinyl Chloride. Available from National Technical Information Service, U.S. Department of Commerce, Springfield, VA. PB 246 691 (1975).

10. Irish, D. D. Halogenated Hydrocarbons: I. Aliphatics. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

11. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

12. Irish, D. D. Halogenated Hydrocarbons: II. Cyclic. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

REFERENCES: CATEGORY 2B (Continued)

13. U.S. Environmental Protection Agency, Office of Research and Development. Scientific and Technical Assessment Report on Vinyl Chloride and Polyvinyl Chloride. Star Series. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC. EPA-600/6-75-004 (1975).

14. National Institute for Occupational Safety and Health. Recommended Standard for Occupational Exposure to Trichloroethylene. Available from National Technical Information Service, Springfield, VA. PB 222222 (1977).

15. Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Rheinhold Company, NY (1977).

CATEGORY 3

ETHERS

SUBCATEGORY: 3A - Noncyclic Aliphatic or Aromatic Ethers

Summary of Subcategory

Total number of compounds in subcategory	3
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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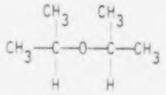
CATEGORY: 3A

WLN: 1Y&OY

ISOPROPYL ETHER: $C_6H_{14}O$ (diisopropyl ether, 2-isopropoxy propane, 2,2'-oxy bis[propane]). 03A020

A colorless, flammable liquid with an ethereal odor.

STRUCTURE:



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{H}{|}}{C}}-O-\overset{\overset{CH_3}{|}}{\underset{\underset{H}{|}}{C}}-CH_3$$

PROPERTIES:

Molecular wt: 102.18; mp: -85.89; bp: 68^{760}; d: 0.7241_4^{20}; vap. d: 3.52; vap. press: 150 mm at 25°; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Isopropyl ether is used as a solvent for oils, fats, waxes, and ethyl cellulose. It is also used in the manufacture of pharmaceuticals and to extract nicotine from tobacco. It also serves as an intermediate in alkylation reactions (ref. 1).

Isopropyl ether is a byproduct in the production of isopropyl alcohol from the propylene fraction of cracked gasoline (ref. 1).

Unstabilized isopropyl ether readily forms peroxides and may explode on shaking. It usually contains p-benzylaminophenol as a stabilizer (ref. 2). Explosive limits are 1.4 to 2.0 percent by volume in air, lower limit, and 7.9 percent by volume in air, upper limit (ref. 1).

Isopropyl ether can be detected by adsorption on silica gel or charcoal, and the use of physical methods such as interferometer, heat of combustion, and gas chromatography (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Isopropyl ether may produce anaesthesia and death at very high concentrations. A group of persons exposed for 15 min to 500 ppm did not consider the exposure irritating. A concentration of 800 ppm for 5 min produced irritation of the eyes and nose (ref. 3).

With regard to metabolic fate, it is probable that the major portion of a dose is eliminated through the lungs after cessation of exposure, and that the compound is not metabolized *in vivo* (ref. 1).

Chief hazards are flammability and explosion due to peroxide formation, rather than toxicity (ref. 1).

LD_{50} (oral, rat): 8,470 mg/kg (ref. 4).

Aquatic toxicity: TLm 96: 1,000 to 100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,050 mg/m^3 (250 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.05×10^6 $\mu g/m^3$ (250 ppm)

Water, Health: $15 \times 1.05 \times 10^6 = 1.58 \times 10^7$ $\mu g/l$

Land, Health: $0.2 \times 1.58 \times 10^7 = 3.16 \times 10^6$ $\mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/l$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ $\mu g/l$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1,050/420 = 2,500$ $\mu g/m^3$

$EPC_{AH1a} = 250/420 = 0.60$ ppm

$EPC_{WH1} = 15 \times 2,500 = 3.75 \times 10^4$ $\mu g/l$

$EPC_{WH2} = 13.8 \times 1,050 = 1.45 \times 10^4$ $\mu g/l$

$EPC_{LH} = 0.2 \times 1.45 \times 10^4 = 2.9 \times 10^3$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/l$

$EPC_{LE} = 0.2 \times 5,000 = 1.0 \times 10^3$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

03A020
ISOPROPYL ETHER

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.05E6		2,500 (0.60)		
Water, $\mu g/l$ (ppm Wt)			1.58E7	1.0E4	14,500	5,000	
Land, $\mu g/g$ (ppm Wt)			3.16E6	2.0E3	2,900	1,000	

*To be multiplied by dilution factor

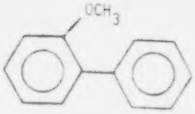
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			2,500 (0.60)		
Water, $\mu g/l$ (ppm Wt)			14,500	5,000	
Land, $\mu g/g$ (ppm Wt)			2,900	1,000	

CATEGORY: 3A

2-METHOXYBIPHENYL: $C_{13}H_{12}O$ (o-phenyl anisole, methyl diphenyl ether). 03A040

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 184.24; mp: 29, bp: 274; d: 1.0233^{99}_{4}; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2-Methoxybiphenyl has been found in samples taken from finished drinking water supplies in the U.S. (ref.5).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 3,600 mg/kg (ref.4)

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 3{,}600 = 1.62 \times 10^5 \times \mu g/m^3$	Air, Ecology:
Water, Health: $15 \times 1.62 \times 10^5 = 2.43 \times 10^6\ \mu g/l$	Water, Ecology:
Land, Health: $0.2 \times 2.43 \times 10^6 = 4.86 \times 10^5\ \mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 3{,}600 = 385.2\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 3{,}600 = 291.6\ \mu g/m^3$

$EPC_{WH1} = 15 \times 291.6 = 4{,}374\ \mu g/l$

$EPC_{WH2} = 0.4 \times 3{,}600 = 1{,}440\ \mu g/l$

$EPC_{LH} = 0.2 \times 1{,}440 = 288\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

03A040
2-METHOXYBIPHENYL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.62E5		292		
Water, $\mu g/l$ (ppm Wt)			2.43E6		1,440		
Land, $\mu g/g$ (ppm Wt)			4.86E5		288		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			292		
Water, $\mu g/l$ (ppm Wt)			1,440		
Land, $\mu g/g$ (ppm Wt)			288		

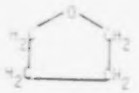
CATEGORY: 3A

WLN: T5OTJ

TETRAHYDROFURAN: C_4H_8O (1,4-epoxybutane, cyclotetramethylene oxide). 03A060

Colorless liquid; penetrating odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 72.12; bp: 64-5; d: 0.888; vap. press: 114 mm at 15° C; vap. d: 2.5; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Tetrahydrofuran decomposes slowly with formation of peroxides. The ring is easily cleaved by acids and other reagents (ref. 6). Tetrahydrofuran is widely used as a solvent.

TOXIC PROPERTIES, HEALTH EFFECTS:

Tetrahydrofuran is reported to cause irritation to the upper respiratory tract and injury to the liver and kidneys of experimental animals when exposed for 20 days to concentrations of 3,000 ppm (ref. 4).

Exposure to concentrations of 25,000 ppm is reported to cause damage to the central nervous system in humans (ref. 2). Exposure to a concentration of 200 ppm is not expected to have a systemic effect in humans (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 590 mg/m^3 (200 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5.9×10^5 $\mu g/m^3$ (200 ppm)
Water, Health: $15 \times 5.9 \times 10^5 = 9 \times 10^6$ $\mu g/\ell$
Land, Health: $0.2 \times 9 \times 10^6 = 1.$[illegible] $\times 10^6$ $\mu g/g$

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 590/420 = 1,400$ $\mu g/m^3$
$EPC_{AH1a} = 200/420 = 0.5$ ppm
$EPC_{WH1} = 15 \times 1,400 = 21,000$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 590 = 8,100$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 8,100 = 1,620$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

03A060
TETRAHYDROFURAN

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			5.9E5 (200)		1,400 (0.5)		
Water, μg/l (ppm Wt)			9.0E6		8,100		
Land, μg/g (ppm Wt)			1.8E6		1,620		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			1,400 (0.5)		
Water, μg/l (ppm Wt)			8,100		
Land, μg/g (ppm Wt)			1,620		

REFERENCES: CATEGORY 3A

Ethers - Noncyclic Aliphatic or Aromatic Ether

1. Rowe, V. K. Glycols. Industrial Hygiene and Toxicology, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York (1963).

2. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

3. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

4. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

5. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

6. Livingstone, R. Compounds Containing a Five-Membered Ring with One Hetero Atom of Group VI: Oxygen. Rodd's Chemistry of Carbon Compounds, Second Edition, Vol. 4, Part A, S. Coffey, Ed., Elsevier Scientific Publishing Company, Amsterdam (1973).

CATEGORY 3

ETHERS

SUBCATEGORY: 3B - Cyclic Ethers

Summary of Subcategory

Total number of compounds in subcategory	3
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

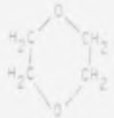
Consent Decree compounds included in subcategory: None

CATEGORY: 3B

WLN: T60 DOTJ

1,4-DIOXANE: $C_4H_8O_2$ (1,4-diethylene dioxide, p-dioxane). 03B020
A colorless, flammable liquid with a faint odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 88.10; mp: 11; bp: 101^{750}; d: 1.030;
vap. press: 40 mm at 25.2; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

All ethers tend to form explosive peroxides.

The odor-recognition level for 1,4-dioxane is reported as 620 mg/m^3 (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

High concentrations of dioxane vapor produce eye, nose, and lung irritation, and cause severe damage to kidneys and liver. A human death has been reported resulting from one week exposure to an average concentration of 470 ppm of dioxane vapors (ref. 2). Exposure to 5,500 ppm for 1 minute caused eye effects (ref. 3). Dioxane may be absorbed through the skin. A concentration of 200 ppm over 8 hours is considered irritating to eyes, nose and throat (ref. 4).

LD_{50} (oral, rat): 7,120 mg/kg.

Dioxane is reported to produce cancer in several animal species when administered in high dosages. The EPA/NIOSH ordering number is 4323. The lowest dose to induce a carcinogenic response is reported as 416 g/kg. The adjusted ordering number is 0.01.

Aquatic toxicity: TLm 96: 1,000 - 100 ppm (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 180 mg/m^3 (50 ppm).

1,4-Dioxane is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to 1,4-dioxane is 1 ppm (3.6 mg/m^3) as a 10-hour workday, time-weighted average (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.6×10^3 μg/m^3 (1 ppm)
Water, Health: $15 \times 3.6 \times 10^3 = 5.4 \times 10^4$ μg/ℓ
Land, Health: $0.2 \times 5.4 \times 10^4 = 1.1 \times 10^4$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 3.6/420 = 8.6$ μg/m^3
$EPC_{AH1a} = 1/420 = 0.002$
$EPC_{WH1} = 15 \times 8.6 = 129$ μg/ℓ
$EPC_{WH2} = 13.8 \times 3.6 = 50$ μg/ℓ
$EPC_{LH} = 0.2 \times 50 = 10$ μg/g

$EPC_{WE1} = 50 \times 100 = 5,000$ μg/ℓ

$EPC_{LE} = 0.2 \times 5,000 = 1.0 \times 10^3$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

03B020
1,4-DIOXANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E3 (1)		8.6 (0.002)		
Water, $\mu g/l$ (ppm Wt)			5.4E4	1.0E4	50	5,000	
Land, $\mu g/g$ (ppm Wt)			1.1E4	2.0E3	10	1,000	

*To be multiplied by dilution factor

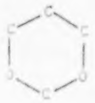
AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			8.6 (0.002)		
Water, $\mu g/l$ (ppm Wt)			50	5,000	
Land, $\mu g/g$ (ppm Wt)			10	1,000	

CATEGORY: 38
1,3-DIOXANE: $C_4H_8O_2$ 038040

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 88.11; mp: 42; bp: 105^{755};
d: 1.0342_4^{20}; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 1,3-dioxane are not available at this time. However, based on data for structurally similar compounds, it is reasonable to expect the LD_{50} for 1,3-dioxane to be >3,000 mg/kg. See table below:

Compound	LD_{50} (oral, rat) in mg/kg
1,4-Dioxane	7,120
4,4-Dimethyl-1,3-dioxane	3,730

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

1,4-Dioxane is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure to 1,4-dioxane is 1 ppm (3.6 mg/m^3) as a 10-hour workday, time-weighted average (ref. 7).

*** MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health: 3.6×10^3 µg/m^3 (1 ppm)

Water, Health: $15 \times 3.6 \times 10^3 = 5.4 \times 10^4$ µg/ℓ

Land, Health: $0.2 \times 5.4 \times 10^4 = 1.1 \times 10^4$ µg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

*** ESTIMATED PERMISSIBLE CONCENTRATIONS**:

$EPC_{AH1} = 10^3 \times 3.6/420 = 8.6$ µg/m^3

$EPC_{AH1a} = 1/420 = 0.002$

$EPC_{WH1} = 15 \times 8.6 = 129$ µg/ℓ

$EPC_{WH2} = 13.8 \times 3.6 = 50$ µg/ℓ

$EPC_{LH} = 0.2 \times 50 = 10$ µg/g

*Based on data for 1,4-dioxane.

MULTIMEDIA ENVIRONMENTAL GOALS

03B040
1,3-DIOXANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects †	Based on Ecological Effects	Based on Health Effects †	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E3 (1)		8.6 (.002)		
Water, $\mu g/l$ (ppm Wt)			5.4E4		50		
Land, $\mu g/g$ (ppm Wt)			1.1E4		10		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			8.6 (.002)		
Water, $\mu g/l$ (ppm Wt)			50		
Land, $\mu g/g$ (ppm Wt)			10		

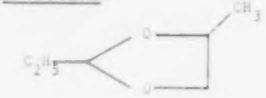
†Based on data for 1,4-dioxane.

CATEGORY: 3B

2-ETHYL-4-METHYL-1,3-DIOXOLANE: $C_6H_{12}O_2$. 03B060.
A liquid.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 116.096; bp: 114-117^{700}

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The odor threshold value for 2-ethyl-4-methyl-1,3-dioxolane is 0.38 ppm at room temperature (ref. 5). It has been identified in finished drinking water (ref. 6).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 2-ethyl-4-methyl-1,3-dioxolane are not available at this time.

Toxic properties are probably similar to those of other cyclic ethers.

LD_{Lo} (oral, rat): 2830 mg/kg

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 2{,}830 = 1.27 \times 10^5$ µg/m^3	Air, Ecology:
Water, Health: $15 \times 1.27 \times 10^5 = 1.9 \times 10^6$ µg/ℓ	Water, Ecology:
Land, Health: $0.2 \times 1.9 \times 10^6 = 3.8 \times 10^5$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 2{,}830 = 303$ µg/m^3

$EPC_{AH3} = 0.081 \times 2{,}830 = 229$ µg/m^3

$EPC_{WH1} = 15 \times 229 = 3{,}438$ µg/ℓ

$EPC_{WH2} = 0.4 \times 2{,}830 = 1{,}132$ µg/ℓ

$EPC_{LH} = 0.2 \times 1{,}132 = 226$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

03B060

2-ETHYL-4-METHYL-1,3-DIOXOLANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.27E5		229		
Water, $\mu g/l$ (ppm Wt)			1.9E6		1,132		
Land, $\mu g/g$ (ppm Wt)			3.8E5		226		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			229		
Water, $\mu g/l$ (ppm Wt)			1,132		
Land, $\mu g/g$ (ppm Wt)			226		

REFERENCES: CATEGORY 3B

Ethers - Cyclic Ethers

1. Bond, R. G., C. P. Straub, and R. Prober, Eds. Handbook of Environmental Control. Vol. 1: Air Pollution. The Chemical Pubber Co., Cleveland, OH (1972).

2. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

3. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

4. American Conference of Governmental Industrial Hygienists. Industrial Ventilation: A Manual of Recommended Practice, Fourteenth Edition. American Conference of Governmental Industrial Hygienists. Lansing, MI (1976).

5. Lillard, D. A., and J. J. Powers. Aqueous Odor Thresholds of Organic Pollutants in Industrial Effluents. U.S. Environmental Protection Agency Rep. 660/4-75-002 (1975).

6. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

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CATEGORY 4

HALOGENATED ETHERS AND EPOXIDES

SUBCATEGORY: 4A - Monohalogenated Ethers and Epoxides

Summary of Subcategory

Total number of compounds in subcategory	11
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	3
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: 7

04A020	Chloromethyl methyl ether
04A080	2-Chloroethylmethyl ether
04A100	Chloromethyl ethyl ether
04A120	2-Chloroethyl ethyl ether
04A140	2-Chloroethyl vinyl ether
04A180	4-Chlorophenyl phenyl ether
04A200	4-Bromophenyl phenyl ether

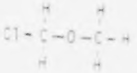
CATEGORY: 4A

CHLOROMETHYL METHYL ETHER: C_2H_5ClO (dimethyl chloroether, methyl chloromethyl ether, monochloromethyl ether, CMME). 04A020

A colorless liquid; highly volatile.

WLN: GIOI

STRUCTURE:



$$Cl-\underset{H}{\overset{H}{C}}-O-\underset{H}{\overset{H}{C}}-H$$

PROPERTIES:

Molecular wt: 80.51; mp: -103.5; bp: 59.5^{759}; d: 1.070_4^{20}; decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Since chloromethyl methyl ether hydrolyzes readily, it would not be expected to remain as such for long periods in waste streams (ref. 1). It is formed by direct chlorination of methyl ether (ref. 2). Commercial chloromethyl methyl ether contains a 95 percent minimum of active ingredients, and several percent bis(chloromethyl)ether as impurity (ref. 1).

Chloromethyl methyl ether is used as a methylating agent; the largest use is in the preparation of ion exchange resins (ref. 1).

Chloromethyl methyl ether can be determined by hydrolysis and subsequent determination of the products and by determination in air by combustion and analysis of the chloride. Turbidimetry, colorimetry, infrared spectroscopy, and gas chromatography are used (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Chloromethyl methyl ether is painful to the eyes and nose in concentrations greater than 100 ppm. Illness or death from exposure to vapors can occur from lung edema or secondary pneumonia (ref. 2).

LD_{50} (oral, rat): 817 mg/kg.

LC_{50} (inhalation, rat): 55 ppm for 7 hours; (hamster): 65 ppm for 7 hours (ref. 4).

Evidence of carcinogenicity: Several haloethers are considered potential carcinogens. Chloromethyl methyl ether is considered a weak carcinogen compared to bis(chloromethyl) ether, a powerful carcinogen (ref. 3). Four cases of lung cancer among 111 workers exposed to chloromethyl methyl (and bis[chloromethyl] ether as impurity) suggest an increased risk of human lung cancer associated with the compound (ref. 1).

Tumors have also been observed in three animal species exposed to pure chloromethyl methyl ether. The EPA/NIOSH ordering number is 7424. The lowest dosage reported to result in an oncogenic response is 312 mg/kg. The adjusted ordering number is 24.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Chloromethyl methyl ether is the subject of a NIOSH Hazard Review Document (ref. 5). It is designated by OSHA as a cancer-suspect agent; special precautions for exposed workers are prescribed (ref. 9). Chloroalkyl ethers, including chloromethyl ether, are listed on the EPA Consent Decree List, Priority 1.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/24 = 2.9 \times 10^3$ μg/m^3

Water, Health: $15 \times 5{,}000 = 4.3 \times 10^4$ μg/l

Land, Health: $0.2 \times 7.5 \times 10^4 = 8.8 \times 10^3$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 817 = 87.4$ μg/m^3

$EPC_{AH3} = 0.081 \times 817 = 66.2$ μg/m^3

$EPC_{WH1} = 15 \times 66.2 = 993$ μg/l

$EPC_{WH2} = 0.4 \times 817 = 326.8$ μg/l

$EPC_{LH} = 0.2 \times 326.8 = 65.4$ μg/g

$EPC_{AC2} = 10^3/6 \times 24) = 6.9$ μg/m^3

$EPC_{WC} = 15 \times 6.9 = 104$ μg/l

$EPC_{LC} = 0.2 \times 104 = 21$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X

04A020

CHLOROMETHYL METHYL ETHER

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.9E3		6.9		
Water, μg/l (ppm Wt)			4.3E4	1.0E4	104	5,000	
Land, μg/g (ppm Wt)			8.8E3	2.0E3	21	1,000	

*To be multiplied by dilution factor

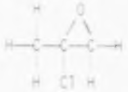
AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			66.2		6.9
Water, μg/l (ppm Wt)			326.8	5,000	104
Land, μg/g (ppm Wt)			65.4	1,000	21

CATEGORY: 4A

2-CHLORO-1,2-EPOXYPROPANE: C_3H_5ClO 04A040

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 92.50

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2-Chloro-1,2-epoxypropane is structurally similar to epichlorhydrin (1-chloro-2,3-epoxypropane) and is probably formed in the epichlorhydrin synthesis.

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 2-chloro-1,2-epoxypropane are not available at this time. Toxicity may be expected to be similar to that of 1-chloro-2,3-epoxypropane (epichlorhydrin).

LD_{50} (oral, rat): 90 mg/kg for 1-chloro-2,3-expoxypropane.

Aquatic toxicity: TLm 96: 100-10 ppm for epichlorhydrin (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 20 mg/m^3 (5 ppm) for epichlorhydrin.

NIOSH recommendation for epichlorhydrin: 2 mg/m^3 (0.5 ppm) (ref. 9).

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2×10^3 $\mu g/m^3$ (0.5 ppm)
Water, Health: $15 \times 2 \times 10^3 = 3.0 \times 10^4$ $\mu g/\ell$
Land, Health: $0.2 \times 3.0 \times 10^4 = 6.0 \times 10^3$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200$ $\mu g/g$

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2/420 = 4.8$ $\mu g/m^3$
$EPC_{AH1a} = 0.5/420 = 0.001$ ppm
$EPC_{WH1} = 15 \times 4.8 = 72$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 2 = 27.6$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 27.6 = 5.5$ $\mu g/g$

$EPC_{WE1} = 50 \times 10 = 500$ $\mu g/\ell$
$EPC_{LE} = 0.2 \times 500 = 100$ $\mu g/g$

*Based on NIOSH recommendation for 1-chloro-2,3-epoxypropane (epichlorhydrin).

MULTIMEDIA ENVIRONMENTAL GOALS

04A040
2-CHLORO-1,2-EPOXYPROPANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal* †		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.0E3 (0.5)		5 (0.001)		
Water, μg/l (ppm Wt)			3.0E4	1.0E3	28	500	
Land, μg/g (ppm Wt)			6.0E3	2.0E2	6	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration †		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			5 (0.001)		
Water, μg/l (ppm Wt)			28	500	
Land, μg/g (ppm Wt)			6	100	

† Based on data for epichlorhydrin.

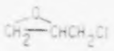
CATEGORY: 4A

WLN: T3OTJ B1G

EPICHLORHYDRIN: C_3H_5ClO (1-chloro-2,3-epoxypropane, chloromethyloxirane, γ-chloropropylene oxide). 04A050

A colorless, mobile liquid with an irritating, chloroform-like odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 92.53; bp: 117.9; mp: -25.6; d: 1.801;
vap. press.: 10 mm at 16.6; vap. d: 3.29; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The threshold for odor recognition is about 10 ppm (ref. 6). This is equivalent to approximately 40 mg/m^3.

Epichlorhydrin is synthesized from petroleum products and used in the manufacture of epoxy resins and other products (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Chloro-2,3-epoxypropane is irritating and toxic by inhalation, ingestion, or skin contact. Marked nose and eye irritation occur at levels over 100 ppm (ref. 6). As low as 20 ppm is reported to cause eye effects (ref. 4).

LD_{50} (oral, rat): 90 mg/kg.

LC_{Lo} (inhalation, rat): 250 ppm for 4 hours.

1-Chloro-2,3-epoxypropane is cumulative (ref. 7), and chronic exposure may cause kidney injury (ref. 7).

1-Chloro-2,3-epoxypropane is reported to cause tumors in mice. The EPA/NIOSH ordering number is 3101. The lowest dose to induce an oncogenic response is reported as 720 mg/kg. The adjusted ordering number is 4.3.

An increased frequency of mutations has been observed in bacteria and other lower organisms following exposure to the substance (ref. 11).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 20 mg/m^3 (5 ppm). (Epichlorhydrin is listed by ACGIH as an "Industrial substance suspect of Carcinogenic potential.")

Epichlorhydrin is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 2 mg/m^3 (0.5 ppm) as a time-weighted average (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2×10^3 μg/m^3 (0.5 ppm)
Water, Health: $15 \times 2 \times 10^3 = 3.0 \times 10^4$ μg/ℓ
Land, Health: $0.2 \times 3.0 \times 10^4 = 6.0 \times 10^3$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ μg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 2/420 = 4.8$ μg/m^3
$EPC_{AH1a} = 0.5/420 = 0.001$ ppm
$EPC_{WH1} = 15 \times 4.8 = 72$ μg/ℓ
$EPC_{WH2} = 13.8 \times 2 = 27.6$ μg/ℓ
$EPC_{LH} = 0.2 \times 27.6 = 5.5$ μg/g
$EPC_{AC2} = 10^3/(6 \times 4.3) = 39$ μg/m^3
$EPC_{WC} = 15 \times 39 = 581$ μg/ℓ
$EPC_{LC} = 0.2 \times 581 = 116$ μg/g

$EPC_{WE1} = 50 \times 10 = 500$ μg/ℓ

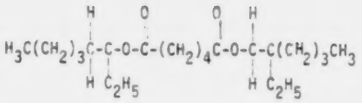
$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

CATEGORY: 8D

DI-2-ETHYLHEXYL ADIPATE: $C_{22}H_{42}O_2$. 08D260
(Bisoflex, Bis(2-ethylhexyl)adipate)
Liquid.

WLN: 4Y2&10V24

STRUCTURE:



$$H_3C(CH_2)_3\overset{H}{\underset{H}{C}}-\underset{C_2H_5}{C}-O-\overset{O}{C}-(CH_2)_4\overset{O}{C}-O-\overset{H}{\underset{H}{C}}-\underset{C_2H_5}{C}(CH_2)_3CH_3$$

PROPERTIES:

Molecular wt: 370.58 ; m.p.:-60; bp:214° at 5 mm; d: $0.0268^{20°}_{20°}$; vapor d: 1.28; vap pres: 2.6 mm at 200°C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Di-2-ethylhexyl adipate has been identified in fresh water and in ground water (ref. 6). Highest concentration quantified in finished drinking water is 0.31 μg/ℓ (ref.10). Adipate esters are used extensively as plasticers.

TOXIC PROPERTIES, HEALTH EFFECTS:

None of the adipates possess a very high degree of acute toxicity and their irritant effect on skin and eyes is very slight (ref. 1). In the case of humans, oral lethal dosage is so high as to be practically indeterminate (ref. 1).

LD_{50} (oral, rat): 9.1 g/kg (ref. 1).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 9{,}100 = 4.10 \times 10^5$ μg/m³

Water, Health: $15 \times 41.0 \times 10^5 = 6.15 \times 10^6$ μg/ℓ

Land, Health: $0.2 \times 6.15 \times 10^6 = 1.23 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 9{,}100 = 973.7$ μg/m³

$EPC_{AH3} = 0.081 \times 9{,}100 = 737.1$ μg/m³

$EPC_{WH1} = 15 \times 737.1 = 1.11 \times 10^4$ μg/ℓ

$EPC_{WH2} = 0.4 \times 9{,}100 = 3{,}640$ μg/ℓ

$EPC_{LH} = 0.2 \times 3{,}640 = 728$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D260
DI-2-ETHYLHEXYL ADIPATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			4.1E5		740		
Water, μg/l (ppm Wt)			6.15E6		3,640		0.31$^+$
Land, μg/g (ppm Wt)			1.23E6		730		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			740		
Water, μg/l (ppm Wt)			3,640		
Land, μg/g (ppm Wt)			730		

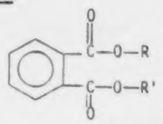
+ Finished Drinking Water

CATEGORY: 8D

WLN: 1OVR BVO1; 2OVR BVO2; 4OVR BVO4

PHTHALATE ESTERS: (MW: 194-279). $C_6H_4O_4RR'$. 08D280
DIMETHYL PHTHALATE: $C_{10}H_{10}O_4$. Colorless, oily liquid. 08D281
DIETHYL PHTHALATE: $C_{12}H_{14}O_4$. Colorless, oily liquid 08D282
DI-n-BUTYL PHTHALATE: $C_{16}H_{22}O_4$. Colorless, oily liquid 08D283

STRUCTURE:



(where R and R' are alkyl groups)

PROPERTIES:

	molecular wt	bp	mp	d	vap. d	vap. press.	solubility in water
Dimethyl phthalate	194.19	238.8	5.5	1.1905_4^{20}	6.69	1 mm at 100.3°	0.43 g/100 ml
Diethyl phthalate	222.24	29.5	-40.5	1.1175_4^{20}	7.66	1 mm at 108.8°	insoluble
Di-n-butyl phthalate	278.35	340		1.047_{20}^{20}	9.58	1 mm at 148.2°	1:2,500

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The phthalate esters are dialkyl esters of phthalic acid and are commonly used as insect repellants.

Diethyl phthalate has been found in samples from public drinking water supplies in concentrations of 1.0 μg/ℓ; dimethyl phthalate, 0.82 μg/ℓ; and dibutyl phthalate, 5.0 μg/ℓ (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

The phthalate esters are not considered highly toxic. Exposure via skin has been widely tested because of use as an insect repellant, and has rarely caused difficulties. They are somewhat irritating to the eyes and nose. Accumulation of phthalate esters in humans is not reported. Ingestion by a human of 140 mg/kg of dibutyl phthalate resulted in temporary effects to the central nervous system (refs. 9, 5); ingestion of 143 mg/kg of bis(2-ethylhexyl) phthalate and dioctyl phthalate caused gastrointestinal tract effects (ref. 5).

Teratogenic effects have been caused in rats by dibutyl phthalate (TD_{Lo}: 874 mg/kg), diethyl phthalate (TD_{Lo}: 1,232 mg/kg), dimethyl phthalate (TD_{Lo}: 1,014 mg/kg), and several other phthalate esters (ref. 5). The EPA/NIOSH ordering number for the phthalate, considered collectively based on teratogenic potential, is 4101. The adjusted ordering number using the lowest dosage reported for teratogenic effects from dibutyl phthalate is 4.7.

Aquatic toxicity: Even though acute toxicity is of a low degree, phthalate esters are accumulated by certain aquatic species, and reproductive impairment sometimes occurs (ref. 12,13). TLm 96 for dibutyl phthalate: 1,000-100 ppm; for benzyl butyl phthalate, over 1,000 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 5 mg/m^3 (for dimethyl phthalate, dibutyl phthalate, diethyl phthalate). (The TLV is recommended to control the mist from the phthalates, since they are often sprayed.)

EPA 1976 water quality criteria: 3 μg/ℓ for freshwater aquatic life (ref. 12).

NAS/NAE 1972 recommended water quality criteria: 0.3 μg/ℓ to protect fish and their food supply (ref. 14).

Phthalate esters are included on the EPA Consent Decree Priority II List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5×10^3 μg/m^3
Water, Health: $15 \times 5 \times 10^3 = 7.5 \times 10^4$ μg/ℓ
Land, Health: $0.2 \times 7.5 \times 10^4 = 1.5 \times 10^4$ μg/g

Air, Ecology:
Water, Ecology: $5 \times 0.3 = 1.5$ μg/ℓ
Land, Ecology: $0.2 \times 1.5 = 0.30$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 5/420 = 12$ μg/m^3
$EPC_{AH1a} = 5/420 = 1.2 \times 10^{-2}$ ppm
$EPC_{WH1} = 15 \times 12 = 180$ μg/ℓ
$EPC_{WH2} = 13.8 \times 5 = 69$ μg/ℓ
$EPC_{LH} = 0.2 \times 69 = 13.8$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/ℓ
$EPC_{WES} = 0.3$ μg/ℓ
$EPC_{LE} = 0.2 \times 0.3 = 0.06$ μg/g
$EPC_{AT} = 10^3/(6 \times 4.7) = 35.5$ μg/m^3
$EPC_{WT} = 15 \times 35.5 = 532.5$ μg/ℓ
$EPC_{LT} = 0.2 \times 532.5 = 106.5$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D280

PHTHALATE ESTERS (MW: 194-279)

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E3		12		
Water, $\mu g/l$ (ppm Wt)			7.5E4	1.5E0	70	0.3	0.82 to 5.0
Land, $\mu g/g$ (ppm Wt)			1.5E4	8.0E-1	14	0.06	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			12 (0.012)		35.5
Water, $\mu g/l$ (ppm Wt)			70	0.3	532.5
Land, $\mu g/g$ (ppm Wt)			14	0.06	106.5

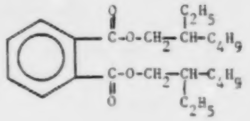
CATEGORY: 8D

WLN: 4Y2&1OV 2 BR

DI-2-ETHYLHEXYL PHTHALATE: $C_{24}H_{38}O_4$

(dioctylester phthalic acid, dioctylester o-benzenedicarboxylic acid, diethyl hexyl phthalate, octyl phthalate). 08D300
A light-colored liquid with a mild odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 390.62 mp: -50; 230 at 5 mm; d: 0.9861^{20}; vap. d: 16.0; vap. press: 1.2 mm at 200° C; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Di-2-ethylhexyl phthalate has been reported in samples taken from drinking water, with the highest reported value at 30 μg/l (ref. 10). It has also been found in river water, raw water, lake and well water (ref. 6).

Di-2-ethylhexyl phthalate is one of the most widely used plasticizers (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Information indicates low toxicity (ref. 1). In chronic studies, rats showed changes in body weight and liver and kidney weights. No irritation or sensitization occurred with patch tests on humans (ref. 1).

In metabolic studies with two human subjects, only 4.5 percent of the total dose (5 and 10 g) could be accounted for as phthalic acid in the urine over a 24 hr period (ref. 1).

LD_{50} (oral, rat): 30 g/kg (ref. 1).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 5 mg/m³ (0.31 ppm).
Di-2-ethylhexyl phthalate is on the EPA Consent Decree Priority II List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	5×10^3 μg/m^3 (0.31 ppm)	Air, Ecology:
Water, Health:	$15 \times 5 \times 10^3 = 7.5 \times 10^4$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 7.5 \times 10^4 = 1.5 \times 10^4$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 5/420 = 11.9$ μg/m^3

$EPC_{AH1a} = 0.31/420 = 7.4 \times 10^{-4}$ ppm

$EPC_{WH1} = 15 \times 11.9 = 178.5$ μg/l

$EPC_{WH2} = 13.8 \times 5 = 69$ μg/l

$EPC_{LH} = 0.2 \times 69 = 13.8$ μg/g

X

MULTIMEDIA ENVIRONMENTAL GOALS

08D300
DI-2-ETHYLHEXYL PHTHALATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E3 (0.31)		12 (0.0007)		
Water, $\mu g/l$ (ppm Wt)			7.5E4		70		30
Land, $\mu g/g$ (ppm Wt)			1.5E4		14		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			12 (0.0007)		
Water, $\mu g/l$ (ppm Wt)			70		
Land, $\mu g/g$ (ppm Wt)			14		

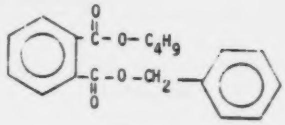
CATEGORY: 8D

BUTYL BENZYL PHTHALATE: $C_{19}H_{20}O_4$. 08D320

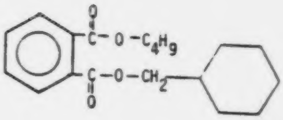
Clear, oily liquid.

WLN:

STRUCTURE:



or



PROPERTIES:

Molecular wt.: 312.39; mp: <-35^{0}; bp: 370^{0}; d: 1.116^{25}_{25}; vap. d: 10.8.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (intraperitoneal, mouse): 3,160 mg/kg (ref. 5).

Aquatic toxicity: TLM = >1,000 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Butyl benzyl phthalate is included on the EPA Consent Decree List, Priority 2.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 3,160 = 1.42 \times 10^5$ μg/m^3

Water, Health: $15 \times 1.42 \times 10^5 = 2.13 \times 10^6$ μg/ℓ

Land, Health: $0.2 \times 2.13 \times 10^6 = 4.26 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times >1,000 = >1.0 \times 10^5$ μg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 3,160 = 338$ μg/m^3

$EPC_{AH3} = 0.081 \times 3,160 = 256$ μg/m^3

$EPC_{WH1} = 15 \times 256 = 3,840$ μg/ℓ

$EPC_{WH2} = 0.4 \times 3,160 = 1,264$ μg/ℓ

$EPC_{LH} = 0.2 \times 1,264 = 253$ μg/g

$EPC_{WE1} = 50 \times >1,000 = >5.0 \times 10^4$ μg/ℓ

$EPC_{LE} = 0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D320
BUTYL BENZYL PHTHALATE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.42E5		260		
Water, $\mu g/l$ (ppm Wt)			2.13E6	1.0E5	1,264	50,000	
Land, $\mu g/g$ (ppm Wt)			4.26E5	2.0E4	260	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			260		
Water, $\mu g/l$ (ppm Wt)			1,260	50,000	
Land, $\mu g/g$ (ppm Wt)			260	10,000	

REFERENCES: CATEGORY 8D

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CATEGORY 9

NITRILES

SUBCATEGORY: 9A - Aliphatic Nitriles

Summary of Subcategory

Total number of compounds in subcategory	6
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: 1

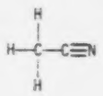
09A040 Acrylonitrile

CATEGORY: 9A

WLN: NC1

ACETONITRILE: C_2H_3N (methyl cyanide, ethanenitrile). 09A020
A colorless liquid with an odor similar to ether.

STRUCTURE:



$\mathrm{H-\overset{H}{\underset{H}{C}}-C\equiv N}$

PROPERTIES:

Molecular wt: 41.03; mp: -41; bp: 81.6; d: 0.783^{25}_{25};
vap. press.: 100 mm at 27°; vap. d: 1.42; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Acetonitrile is decomposed by heat. The odor is reported to be detectable at 40 ppm or 70 mg/m^3 (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Human death has resulted from exposure to high concentrations of acetonitrile. Bronchial effects have resulted from exposure to 160 ppm. Exposure to concentrations below 40 ppm is not expected to cause organic cyanide poisoning or injury to the respiratory tract (ref. 1).

Animal studies show that different species and individuals vary widely in susceptibility to acetonitrile (ref. 1).

LD_{50} (oral, rat): 3,800 mg/kg
LC_{Lo} (inhalation, rat): 8,000 ppm for 4 hours.
Aquatic toxicity: TLm 96: 1,000 ppm

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 70 mg/m^3 (40 ppm).

Acetonitrile is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 34 mg/m^3 (20 ppm) as a time-weighted average (ref. 13).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.4×10^4 $\mu g/m^3$ (20 ppm)
Water, Health: $15 \times 3.4 \times 10^4 = 5.1 \times 10^5$ $\mu g/\ell$
Land, Health: $0.2 \times 5.1 \times 10^5 = 1.02 \times 10^5$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 1{,}000 = 1.0 \times 10^5$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 34/420 = 81$ $\mu g/m^3$
$EPC_{AH1a} = 20/420 = 0.05$ ppm
$EPC_{WH1} = 15 \times 81 = 1{,}215$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 34 = 469$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 469 = 94$ $\mu g/g$

$EPC_{WE1} = 50 \times 1{,}000 = 50{,}000$ $\mu g/\ell$
$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

09A020
ACETONITRILE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.4E4 (20)		81 (0.05)		
Water, μg/l (ppm Wt)			5.1E5	1.0E5	470	50,000	
Land, μg/g (ppm Wt)			1.0E5	2.0E4	94	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			81 (0.05)		
Water, μg/l (ppm Wt)			470	50,000	
Land, μg/g (ppm Wt)			94	10,000	

CATEGORY: 9A

WLN: NC1U1

ACRYLONITRILE: C_3H_3N (cyanoethylene, vinyl cyanide, acrylon, 2-propenitrile). An explosive, flammable liquid with a penetrating odor. 09A040

STRUCTURE:

$CH_2 = CHCN$

PROPERTIES:

Molecular wt: 53.04; mp: -82; bp: 78.5; d: 0.8060;
vap. press.: 200 mm at 38.7; 100 mm at 22.8°; vap. d: 1.83; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The odor threshold level for acrylonitrile is reported as 21.4 ppm (ref. 2). Acrylonitrile can be formed by the reaction of acetylene with hydrogen cyanide.

TOXIC PROPERTIES, HEALTH EFFECTS:

Vapors of acrylonitrile are extremely toxic and inhibit respiratory enzymes in cells. It is absorbed through the skin with possible formation of cyanide in the tissues (ref. 3). There is little evidence of cumulative action on repeated exposure (ref. 4).

LD_{50} (oral, rat): 82 mg/kg.

LC_{Lo} (inhalation, rat): 500 ppm for 4 hours; (mouse): 784 ppm for 1 hour.

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 5).

A concentration of 18 mg/ℓ of acrylonitrile in water is reported to cause tainting of fish flesh (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Acrylonitrile is on EPA Consent Decree Priority III List.

TLV = 45 mg/m^3 (20 ppm).

OSHA regulations for acrylonitrile limit occupational exposure to 2 ppm or 4.5 mg/m^3 averaged over 8 hours (ref. 12).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 4.5×10^3 $\mu g/m^3$ (2 ppm)
Water, Health: $15 \times 4.5 \times 10^3 = 6.75 \times 10^4$ $\mu g/\ell$
Land, Health: $0.2 \times 6.75 \times 10^4 = 1.35 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^2$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 4.5/420 = 11$ $\mu g/m^3$
$EPC_{AH1a} = 2/420 = 0.005$ ppm
$EPC_{WH1} = 15 \times 11 = 165$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 4.5 = 62$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 62 = 12$ $\mu g/g$

$EPC_{WE1} = 50 \times 10 = 500$ $\mu g/\ell$
$EPC_{WE2} = 18{,}000$ $\mu g/\ell$ (to prevent tainting)
$EPC_{LE} = 0.2 \times 500 = 100$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

09A040 ACRYLONITRILE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.5E3 (2)		11 (0.005)		
Water, µg/l (ppm Wt)			6.75E4	1.0E3	62	500	
Land, µg/g (ppm Wt)			1.35E4	2.0E5	12	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

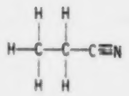
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			11 (0.005)		
Water, µg/l (ppm Wt)			62	500	
Land, µg/g (ppm Wt)			12	100	

CATEGORY: 9A
1-CYANOETHANE: C_3H_5N (propionitrile, ethyl cyanate, ethyl cyanide, propanenitrile). 9CA060

A colorless liquid with a pleasant, ethereal odor.

WLN: NC2

STRUCTURE:



$H-CH_2-CH_2-C\equiv N$

PROPERTIES:

Molecular wt: 55.08; mp: -103.5; bp: 97.1; vap. d: 1.9; vap. press: 40 mm Hg at 22°; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1-Cyanoethane is used in organic synthesis (ref. 3). It can be formed by the dehydration of propionamide or by the reduction of acrylonitrile (ref. 10).

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Cyanoethane is a primary irritant on the skin and eye (ref. 10). It can also cause the same general symptoms as hydrogen cyanide (ref. 3). In the body, it is believed to produce its action by rapid metabolism to the cyanide ion (ref. 3).

LD_{50} (oral, rat): 39 mg/kg (ref. 5).

LD_{Lo} (inhalation, rat): 500 ppm for 4 hours (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

1-Cyanoethane is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 14 mg/m^3 (6 ppm) as a time-weighted average (ref. 13).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	1.4×10^4 μg/m^3 (6 ppm)	Air, Ecology:
Water, Health:	$15 \times 1.4 \times 10^4 = 2.1 \times 10^5$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 2.1 \times 10^5 = 4.2 \times 10^4$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 10^3 \times 14/420 = 33.3$ μg/m^3

$EPC_{AH3} = 6/420 = 0.014$ ppm

$EPC_{WH1} = 15 \times 33.3 = 499.5$ μg/l

$EPC_{WH2} = 13.8 \times 14 = 193.2$ μg/l

$EPC_{LH} = 0.2 \times 193.2 = 38.6$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

09A060
1-CYANOETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.4E4 (6)		33		
Water, μg/l (ppm Wt)			2.1E5		193		
Land, μg/g (ppm Wt)			4.2E4		39		

*To be multiplied by dilution factor

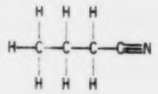
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			33 (0.014)		
Water, μg/l (ppm Wt)			193		
Land, μg/g (ppm Wt)			39		

CATEGORY: 9A

BUTYRONITRILE: C_4H_7N (butanitrile, propyl cyanide, cyanopropane). 09AC30
A colorless liquid.

WLN: NC3

STRUCTURE:



PROPERTIES:
Molecular wt: 69.10; mp: -112.6; bp: 117; d: 0.796^{15}; vap. d: 2.4; vap. press: 10 mm Hg at 15.4°; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Butyronitrile is considered a highly hazardous material (ref. 11). Animal experiments show toxicity similar to that of cyanides and other active nitriles (ref. 3).
LD_{50} (oral, rat): 50-100 mg/kg (ref. 3).
LC_{Lo} (inhalation, rat): 400 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

n-Butyronitrile is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 22 mg/m^3 (8 ppm) as a time-weighted average (ref. 13).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.2×10^4 μg/m^3 (8 ppm) Air, Ecology:
Water, Health: $15 \times 2.2 \times 10^4 = 3.3 \times 10^5$ μg/l Water, Ecology:
Land, Health: $0.2 \times 3.3 \times 10^5 = 6.6 \times 10^4$ μg/g Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 22/420 = 52.4$ μg/m^3
$EPC_{AH1a} = 8/420 = 0.02$ ppm
$EPC_{WH1} = 15 \times 52.4 = 786$ ug/l
$EPC_{WH2} = 13.8 \times 22 = 303.6$ ug/l
$EPC_{LH} = 0.2 \times 303.6 = 60.7$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

09A080
BUTYRONITRILE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.2E4 (8)		52 (0.02)		
Water, μg/l (ppm Wt)			3.3E5		304		
Land, μg/g (ppm Wt)			6.6E4		61		

*To be multiplied by dilution factor

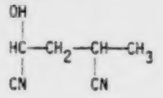
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			52 (0.02)		
Water, μg/l (ppm Wt)			304		
Land, μg/g (ppm Wt)			61		

CATEGORY: 9A

1,3-DICYANO-1-HYDROXYBUTANE: $C_6H_8ON_2$
(1-hydroxy-2-methyl glutaronitrile). 09A100

WLN:

STRUCTURE:



$$\begin{array}{c} OH \\ | \\ HC \\ | \\ CN \end{array}\!\!-CH_2-\!\!\begin{array}{c} CH \\ | \\ CN \end{array}\!\!-CH_3$$

PROPERTIES:

Molecular wt: 124.08

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

It has been suggested that the presence of the hydroxy group in the beta position relative to the nitrile group results in a lower order of toxicity. When the hydroxyl group is in the alpha position adjacent to the CN group, the extreme toxicity (i.e., hydrolysis in the body to release cyanide) is retained (ref. 3).

1,3-Dicyano-1-hydroxybutane is probably similar in toxicity to butyronitrile.

LD_{50} (oral, rat): 50-100 mg/kg for butyronitrile.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

n-Butyronitrile is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 22 mg/m^3 (8 ppm) as a time-weighted average (ref. 13).

* MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.2×10^4 µg/m^3 (8 ppm)	Air, Ecology:
Water, Health: $15 \times 2.2 \times 10^4 = 3.3 \times 10^5$ µg/l	Water, Ecology:
Land Health: $0.2 \times 3.3 \times 10^5 = 6.6 \times 10^4$ µg/g	Land, Ecology:

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH1} = $10^3 \times 22/420 = 52.4$ µg/m^3

EPC_{AH1a} = $8/420 = 0.02$ ppm

EPC_{WH1} = $15 \times 52.4 = 786$ µg/l

EPC_{WH2} = $13.8 \times 22 = 303.6$ µg/l

EPC_{LH} = $0.2 \times 303.6 = 60.7$ µg/g

*Based on NIOSH recommendation for butyronitrile.

MULTIMEDIA
ENVIRONMENTAL
GOALS

09A100
1,3-DICYANO-1-HYDROXYBUTANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on † Health Effects	Based on Ecological Effects	Based on† Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.2E4 (8)		52 (0.02)		
Water, µg/l (ppm Wt)			3.3E5		304		
Land, µg/g (ppm Wt)			6.6E4		61		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on† Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			52 (0.02)		
Water, µg/l (ppm Wt)			304		
Land, µg/g (ppm Wt)			61		

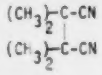
†Based on data for butyronitrile.

CATEGORY: 9A

WLN: NCX&&XCN

TETRAMETHYLSUCCINONITRILE: $C_8H_{12}N_2$ (TSN, TMSN).
Crystallizes in plates; nearly odorless. 09A120

STRUCTURE:



$$\begin{array}{l}(CH_3)_2\!-\!C\!-\!CN \\ \qquad\quad\;\, | \\ (CH_3)_2\!-\!C\!-\!CN\end{array}$$

PROPERTIES:

Molecular wt: 136.22; mp: 169 (sublimes); d: 1.070; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Tetramethylsuccinonitrile is one of the decomposition products of azobisisobutyronitrile, a blowing agent used in the production of vinyl foam (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Tetramethylsuccinonitrile is used as a strong convulsant in experimental animals and in man. It is absorbed through the skin and detoxified slowly in the body. Cumulative effects were not noted in animal tests. Systemic effects caused in exposed workers included headache, nausea, and convulsions (refs. 1,4).

LC_{Lo} (inhalation, rat): 60 ppm for 2-3 hours; 6 ppm for 30 hours.
LD_{Lo} (oral, rat): 25 mg/kg.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 3 mg/m^3 (0.5 ppm)

Tetramethyl is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 6 mg/m^3 as a time-weighted average (ref. 13).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.0×10^3 $\mu g/m^3$ (0.5 ppm)	Air, Ecology:
Water, Health: $15 \times 3.0 \times 10^3 = 4.5 \times 10^4$ $\mu g/\ell$	Water, Ecology:
Land, Health: $0.2 \times 4.5 \times 10^4 = 9.0 \times 10^3$ $\mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 3/420 = 7\ \mu g/m^3$
$EPC_{AH1a} = 0.5/420 = 0.001$ ppm
$EPC_{WH1} = 15 \times 7 = 105\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 3 = 41\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 41 = 8.2\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

09A120
TETRAMETHYLSUCCINONITRILE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.0E3		7 (0.001)		
Water, $\mu g/l$ (ppm Wt)			4.5E4		41		
Land, $\mu g/g$ (ppm Wt)			9.0E3		8		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			7 (.001)		
Water, $\mu g/l$ (ppm Wt)			41		
Land, $\mu g/g$ (ppm Wt)			8		

REFERENCES: CATEGORY 9A

Nitriles - Aliphatic Nitriles

1. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

2. Billings, C. E., Technological Sources of Air Pollution. Industrial Pollution, N. I. Sax, Ed., Van Nostrand Rheinhold Co., New York, NY (1974).

3. Fasset, D. W. Cyanides and Nitriles. Industrial Hygiene and Toxicology, Second Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

4. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

5. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

6. Bond, R. G., C. P. Straub, and R. Prober, Eds. Handbook of Environmental Control. Vol. 3: Water Supply and Treatment. The Chemical Rubber Co., Cleveland, OH (1973).

7. Jacobson, J. S., and A. C. Hill, Eds. Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas. Informative Report No. 1. TR-70 Agricultural Committee-Air Pollution Control Administration. Herbich and Held Printing Co., Pittsburgh, PA (1970).

8. Chemical Industry Institute of Toxicology. First Priority Chemicals. Chemical Industry Institute of Toxicology: Annual Report. Research Triangle Park, NC (1976).

9. National Air Pollution Control Administration. Air Quality Criteria for Hydrocarbons. Available from National Technical Information Service, U.S. Department of Commerce, Springfield, VA. PB 190 489 (1970).

10. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

11. Hamblin, D. O. Aromatic Nitro and Amino Compounds. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

REFERENCES: CATEGORY 9A (Continued)

12. U.S. Department of Labor. Occupational Safety and Health Administration. Federal Register 43: 45762 (1978).

13. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Nitriles. National Institute for Occupational Safety and Health. U.S. Department of Health, Education, and Welfare, DHEW (NIOSH) Publication No. 78-212 (1978).

CATEGORY 9

NITRILES

SUBCATEGORY: 9B - Aromatic Nitriles

Summary of Subcategory

Total number of compounds in subcategory	3
number of parent compounds with subspecies	1
number of subspecies	2
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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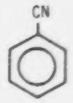
CATEGORY: 9B

WLN: NCR

BENZONITRILE: C_7H_5N (cyanobenzene, phenyl cyanide). A colorless, flammable liquid with an almond-like odor. 09B020

STRUCTURE:



PROPERTIES:

Molecular wt: 103; mp: -13; bp: 190-192; d: 1.010^{15}_{15}; vap. press.: 1 mm at 28.2°; slightly soluble in cold water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Benzonitrile decomposes when heated to give toxic vapors.

TOXIC PROPERTIES, HEALTH EFFECTS:

Benzonitrile is considered to be highly toxic (ref. 1).

LD_{Lo} (oral, rat): 720 mg/kg.

LC_{Lo} (inhalation, rat): 950 ppm for 8 hours (ref. 2).

It has been suggested that when the CN group is directly attached to the aromatic ring, it probably is hydrolyzed to a carboxy group and ammonia. Benzonitrile has been shown to be excreted slowly, principally as phenolic conjugates and only about 10 percent as benzoic acid (ref. 3).

Aquatic toxicity: 96-hr TLm = 78 mg/ℓ for fathead minnow (ref. 4). Inhibition of cell multiplication in algae may begin at 3.4 mg/ℓ (ref 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 720 = 3.24 \times 10^4\ \mu g/m^3$

Water, Health: $15 \times 3.24 \times 10^4 = 4.9 \times 10^5\ \mu g/\ell$

Land, Health: $0.2 \times 4.9 \times 10^5 = 9.8 \times 10^4\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 78 = 7.8 \times 10^3\ \mu g/\ell$

Land, Ecology: $0.2 \times 7.8 \times 10^3 = 1.6 \times 10^3\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 720 = 77\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 720 = 58\ \mu g/m^3$

$EPC_{WH1} = 15 \times 58 = 870\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 720 = 290\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 290 = 58\ \mu g/g$

$EPC_{WE1} = 50 \times 78 = 3{,}900\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 3{,}900 = 780\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

09B020
BENZONITRILE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.2E4		58		
Water, $\mu g/l$ (ppm Wt)			4.9E5	7.8E3	290	3,900	
Land, $\mu g/g$ (ppm Wt)			9.8E4	1.6E3	58	780	

*To be multiplied by dilution factor

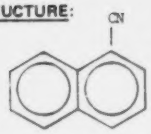
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			58		
Water, $\mu g/l$ (ppm Wt)			290	3,900	
Land, $\mu g/g$ (ppm Wt)			58	780	

CATEGORY: 9B

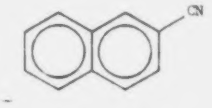
NAPHTHONITRILES: $C_{11}H_7N$ (cyanonaphthalenes). 09B040
α-NAPHTHONITRILE: (1-cyanonaphthalene, 1-naphthonitrile).
White crystals. 09B041
β-NAPHTHONITRILE: (2-cyanonaphthalene, 2-naphthonitrile).
A solid. 09B042.

WLN:

STRUCTURE:



α-naphthonitrile



β-naphthonitrile

PROPERTIES:

	mol.wt	mp.	bp.	d.	solubility in water
α-naphthonitrile:	153.19	38	299^{760}	1.1113^{25}	insoluble
β-naphthonitrile:	153.19	68	$304\text{-}5^{760}$	1.0939^{90}	insoluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

α-and β-napthonitrile occur in coal tar (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

α- and β-naphthonitrile have been reported to interfere with cell reproduction, and β-naphthonitrile is reported to cause chromosomal aberrations (ref. 6).

Specific toxicity data are not available for the naphthonitriles. Their toxicity will probably be similar to that of benzonitrile. It has been suggested that when the CN group is directly attached to the aromatic ring, it is probably hydrolyzed to a carboxy group and ammonia (ref. 3).

LD_{Lo} (oral, rat): 720 mg/kg for benzonitrile (ref. 2).

Aquatic toxicity: 96-hr TLm = 78 mg/ℓ for benzonitrile (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

* **MINIMUM ACUTE TOXICITY CONCENTRATIONS:**

Air, Health: $45 \times 720 = 3.24 \times 10^4$ μg/m^3

Water, Health: $15 \times 3.24 \times 10^4 = 4.9 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 4.9 \times 10^5 = 9.8 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 78 = 7.8 \times 10^3$ μg/ℓ

Land, Ecology: $0.2 \times 7.8 \times 10^3 = 1.6 \times 10^3$ μg/g

* **ESTIMATED PERMISSIBLE CONCENTRATIONS:**

EPC_{AH2} = 0.107 x 720 = 77 μg/m^3

EPC_{AH3} = 0.081 x 720 = 58 μg/m^3

EPC_{WH1} = 15 x 58 = 870 μg/ℓ

EPC_{WH2} = 0.4 x 720 = 290 μg/ℓ

EPC_{LH} = 0.2 x 290 = 58 μg/g

EPC_{WE1} = 50 x 78 = 3,900 μg/ℓ

EPC_{LE} = 0.2 x 3,900 = 780 μg/g

*Based on data for benzonitrile.

09B040
NAPHTHONITRILES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent†		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			3.2E4		58		
Water, μg/l (ppm Wt)			4.9E5	7.8E3	290	3,900	
Land, μg/g (ppm Wt)			9.8E4	1.6E3	58	780	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration†		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			58		
Water, μg/l (ppm Wt)			290	3,900	
Land, μg/g (ppm Wt)			58	780	

†Based on data for benzonitrile.

REFERENCES: CATEGORY 9B

Nitriles - Aromatic Nitriles

1. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

2. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication (NIOSH) 76-191 (1976).

3. Fasset, D. W. Cyanides and Nitriles. Industrial Hygiene and Toxicology, Second Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

4. Verschueren, K. Handbook of Environmental Data on Organic Chemicals. Van Nostrand Rheinhold Company, NY (1977).

5. Kruber, R. Chemische Berichte. Vol. 71, p. 2483 (1938).

6. Izard, C. Comptes Rendeous Academie Science, Section D, 252: 2581 (1971).

CATEGORY 10

AMINES

SUBCATEGORY: 10A - Primary Aliphatic Amines and Diamines

Summary of Subcategory

Total number of compounds in subcategory	13
number of parent compounds with subspecies	2
number of subspecies	6
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

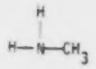
Consent Decree compounds included in subcategory: None

CATEGORY: 10A

METHYLAMINE: CH_5N. (amino-methane, monomethylamine). A colorless, flammable gas with a strong ammoniacal odor. 10A020

WLN: Z1

STRUCTURE:



$H{-}N(H){-}CH_3$

PROPERTIES:

Molecular wt: 31.06; mp: -93.5; bp: -6.3^{760}; d: 0.699^{11}; vap. d: 1.07; vap. press: 2 atm at 25°; pKa = 10.64; very soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Methylamine is present in herring brine, plants, and in crude methanol (ref. 1). The odor threshold concentration is <10 ppm (ref. 2). At concentration <100 ppm, it possesses a distinct fish-like odor (ref. 2).

Methylamine can be formed from methanol and ammonia. It is used in tanning operations, and as chemical intermediates in the chemical and pharmaceutical industries (refs. 1, 2).

Methylamine has been identified as a normal constituent of mammalian and human urine (ref. 2).

Methylamine has been identified in samples taken from river water in concentrations of 1-20.6 ppb (ref. 8).

Methylamine occurs in fresh vegetables, apples, maize, prepared herring, cheese, coffee, cocoa, and black tea (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methylamine is irritating to the lungs, upper respiratory tract, and eyes (ref. 2). Chemical bronchitis occurred in a worker exposed to methylamine at concentrations from 2 to 60 ppm (ref. 3).

Methylamine is rapidly absorbed and is not excreted in the urine to any appreciable extent (ref. 2).

LD_{50} (oral, rat): 100 mg/kg (ref. 2).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 12 mg/kg (10 ppm). This value is assigned on the basis of analogy with ethylamine (ref. 3).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.2×10^4 µg/m^3 (10 ppm)

Water, Health: $15 \times 1.2 \times 10^4 = 1.8 \times 10^5$ µg/l

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ µg/l

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 12/420 = 28.6$ µg/m^3

$EPC_{AH1a} = 10/420 = 0.02$ ppm

$EPC_{WH1} = 15 \times 28.6 = 429$ µg/l

$EPC_{WH2} = 13.8 \times 12 = 165.6$ µg/l

$EPC_{WE1} = 50 \times 10 = 500$ µg/l

MULTIMEDIA ENVIRONMENTAL GOALS

10A020
METHYLAMINE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.2E4 (10)		28.6 (0.02)		
Water, $\mu g/l$ (ppm Wt)			1.8E5	1.0E3	166	500	1-20.6
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			28.6 (0.02)		
Water, $\mu g/l$ (ppm Wt)			166	500	
Land, $\mu g/g$ (ppm Wt)					

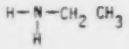
CATEGORY: 10A

ETHYLAMINE: C_2H_7N (1-aminoethane, ethanamine) 10A040

A colorless, flammable liquid with a strong ammoniacal odor.

WLN: Z2

STRUCTURE:



$H-\underset{\displaystyle H}{\underset{|}{N}}-CH_2\,CH_3$

PROPERTIES:

Molecular wt: 45.10; bp: 16.6°; d: 0.689^{15}_{15}; pK_a: 10.75 (ref. 2); vap. press.: 400 mm at 2°; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethylamine is a strong base and a normal constituent of human urine (ref. 2).

Rural concentration in air has been reported as 21 ppb (ref. 5). This is equivalent to 38.7 $\mu g/m^3$. This value may be unduly high since it is representative of an agricultural setting.

Ethylamine has been identified in samples taken from river water in concentrations of 0.6-37.1 ppb (ref. 8).

Ethylamine occurs in fresh and preserved vegetables, maize, prepared herring, cheese, and coffee (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Experiments with animals indicate irritation of the cornea as well as lung, liver, and kidney damage for a 6-week exposure at levels of 100 ppm (ref. 2).

LD_{Lo} (oral, rat): 400 mg/kg (ref. 4)

LC_{Lo} (inhalation, rat): 3,000 ppm/4 hr (ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 18 mg/m^3 (10 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.8×10^4 $\mu g/m^3$ (10 ppm)

Water, Health: $15 \times 1.8 \times 10^4 = 2.7 \times 10^5$ $\mu g/\ell$

Land, Health: $0.2 \times 2.7 \times 10^5 = 5.4 \times 10^4$ $\mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ $\mu g/\ell$

Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 18/420 = 43$ $\mu g/m^3$

$EPC_{AH1a} = 10/420 = 0.024$ ppm

$EPC_{WH1} = 15 \times 43 = 645$ $\mu g/\ell$

$EPC_{WH2} = 13.8 \times 18 = 248$ $\mu g/\ell$

$EPC_{LH} = 0.2 \times 248 = 50$ $\mu g/g$

$EPC_{WE1} = 50 \times 10 = 500$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 500 = 100$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A040
ETHYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.8E4 (10)		43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			2.7E5	1.0E3	248	500	0.6-37.1
Land, $\mu g/g$ (ppm Wt)			5.4E4	2.0E2	50	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			248	500	
Land, $\mu g/g$ (ppm Wt)			50	100	

CATEGORY: 10A

WLN: Z2Q

ETHANOLAMINE: C_2H_7NO (2-aminoethanol, 2-hydroxylethylamine). A colorless, oily liquid; faint, ammoniacal odor. 10A060

STRUCTURE:

$H_2NCH_2CH_2OH$

Ethanolamine

PROPERTIES:

Molecular wt: 61.10; bp: 171-172°; pK_a: 9.44 (ref. 2); d: 1.022^{20}_{20}; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethanolamine is a strong base, and a normal constituent of human urine (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Animal studies indicate that ethanolamine has an irritant and necrotic effect on the skin (ref. 3).

LD_{50} (oral, rat): 2,100 mg/kg (ref. 4).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 6 mg/m^3 (3 ppm) (level believed sufficient to prevent systemic effects).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 6.0×10^3 $\mu g/m^3$ (3 ppm)
Water, Health: $15 \times 6 \times 10^3 = 9.0 \times 10^4$ $\mu g/\ell$
Land, Health: $0.2 \times 9.0 \times 10^4 = 1.8 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 6/420 = 14$ $\mu g/m^3$
$EPC_{AH1a} = 3/420 = 0.007$ ppm
$EPC_{WH1} = 15 \times 14 = 210$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 6 = 83$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 83 = 17$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A060
ETHANOLAMINE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.0E3 (3)		14 (0.007)		
Water, $\mu g/l$ (ppm Wt)			9.0E4	1.0E4	83	5,000	
Land, $\mu g/g$ (ppm Wt)			1.8E4	2.0E3	17	1,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			14 (0.007)		
Water, $\mu g/l$ (ppm Wt)			83	5,000	
Land, $\mu g/g$ (ppm Wt)			17	1,000	

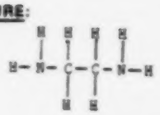
CATEGORY: 10A

1,2-DIAMINOETHANE: $C_2H_8N_2$ (ethylenediamine, 1,2-ethanediamine, dimethylenediamine). 10A080

A clear, hygroscopic liquid with an ammonia-like odor.

WLN: Z2Z

STRUCTURE:



$H-\overset{H}{N}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-\overset{H}{N}-H$

PROPERTIES:

Molecular wt: 60.11; mp: 8.5; bp: 116.5; d: 0.8995^{20}_{20}; vap. d: 2.07; vap. press: 10.7 mm at 20°; strongly alkaline; very soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,2-Diaminoethane is used as a food additive permitted in food for human consumption (ref. 6). It is also used as a chemical intermediate in the production of pharmaceutical agents, dyestuffs, ion exchange resins, and in polymer formation (ref. 2). It is formed from ethylene dichloride and ammonia (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Dermatitis occurred in a high proportion of exposed operating personnel manufacturing mixed ethylene amines (ref. 2). In a 4-yr study of a number of workers exposed to a mixture of alkyl diamines that included ethylenediamine, it was concluded that: (1) ethyleneamines are important causes of dermatitis; and (2) they are irritative and allergenic. It is very difficult to set a TLV that will insure prevention of hypersensitive responses (ref. 3). Severe eye damage may result from exposure (ref. 2).

Human inhalation of 200 ppm for 5-10 seconds produced tingling of face and nasal mucosa irritation (ref. 2).

LD_{50} (oral, rat): 760 mg/kg (ref. 4).

LC_{50} (inhalation, rat): 4,000 ppm/8 hr (ref. 4).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 25 mg/m³ (10 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	2.5×10^4 μg/m³ (10 ppm)	Air, Ecology:	
Water, Health:	$15 \times 2.5 \times 10^4 = 3.75 \times 10^5$ μg/l	Water, Ecology:	$100 \times 10 = 1{,}000$ μg/l
Land, Health:	$0.2 \times 3.75 \times 10^5 = 7.5 \times 10^4$ μg/g	Land, Health:	$0.2 \times 1{,}000 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 25/420 = 59$ μg/m³	
$EPC_{AH1a} = 10/420 = 0.02$ ppm	
$EPC_{WH1} = 15 \times 59 = 892.5$ μg/l	$EPC_{WE1} = 50 \times 10 = 500$ μg/l
$EPC_{WH2} = 13.8 \times 25 = 345$ μg/l	
$EPC_{LH} = 0.2 \times 345 = 69$ μg/g	$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

10A080

1,2-DIAMINOETHANE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.5E4		59 (0.02)		
Water, μg/l (ppm Wt)			3.8E5	1.0E3	345	500	
Land, μg/g (ppm Wt)			7.5E4	2.0E2	69	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

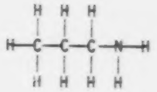
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			59 (0.02)		
Water, μg/l (ppm Wt)			345	500	
Land, μg/g (ppm Wt)			69	100	

CATEGORY: 10A

1-AMINOPROPANE: C_3H_9N (n-propylamine, mono-n-propylamine, propanamine). 10A100
A colorless, highly volatile liquid with a strong ammonia odor.

WLN: Z3

STRUCTURE:



PROPERTIES:

Molecular wt: 59.11; mp: -83; bp: 48-49; d: 0.719^{20}_{20}; vap. press: 248 mm at 20° C; pKa = 10.59; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1-Aminopropane can be formed from propionaldehyde and ammonia, by hydrogenation of nitropropane and by hydrogenation of propionitrile (ref. 1). Background concentration in rural atmosphere is reported as 9 ppb. This is equivalent to 22 $\mu g/m^3$ (ref. 5). This level is representative of an agricultural area and is not indicative of natural background. 1-Aminopropane has also been reported in finished drinking water supplies (ref. 7).

TOXIC PROPERTIES, HEALTH EFFECTS:

1-Aminopropane is a strong irritant and possibly a sensitizer (ref. 6).
LD_{50} (oral, rat): 200 mg/kg (ref. 2).
LC_{50} (inhalation, rat): 2,310 ppm/4 hr. (ref. 4).
Aquatic toxicity: TLm 96: 100-10 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 200 = 9{,}000\ \mu g/m^3$

Water, Health: $15 \times 9{,}000 = 1.35 \times 10^5 \mu g/l$

Land, Health: $0.2 \times 1.35 \times 10^5 = 2.7 \times 10^4\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000\ \mu g/l$

Land, Ecology: $0.2 \times 1{,}000 = 200\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 200 = 21.4\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 200 = 16.2\ \mu g/m^3$

EPC$_{[illegible]1}$ $= 15 \times 16.2 = 243\ \mu g/l$

$EPC_{WH2} = 0.4 \times 200 = 80\ \mu g/l$

$EPC_{LH} = 0.2 \times 80 = 16\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/l$

$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A100
1-AMINOPROPANE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			9.0E3		16.2		22 (0.009)†
Water, μg/l (ppm Wt)			1.4E5	1.0E3	80	500	
Land, μg/g (ppm Wt)			2.70E4	2.0E2	16	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			16.2		
Water, μg/l (ppm Wt)			80	500	
Land, μg/g (ppm Wt)			16	100	

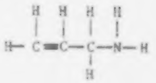
†Representative of an agricultural area.

CATEGORY: 10A

3-AMINOPROPENE: C_3H_7N (allylamine, 2-propene-1-amine, 3-amino propylene, monoallyamine). 10A110
A colorless liquid with a burning taste and a strong ammonia odor.

WLN: Z2U1

STRUCTURE:



PROPERTIES:

Molecular wt: 57.09; bp: 58; d: 0.7621^{20}_{4}; vap. d: 2.00; pKa = 9.53; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

3-Aminopropene is used in the manufacture of mercurial diuretics. It is formed from allyl chloride and ammonia (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

3-Aminopropene may cause excitement, convulsions, and death (ref. 1). At 2.5 ppm human subjects report mucous membrane irritation and chest discomfort; at 14 ppm, 3-aminopropene is intolerable to most individuals (ref. 2).

LD_{50} (oral, rat): 106 mg/m^3 (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 106 = 4{,}770\ \mu g/m^3$	Air, Ecology:	
Water, Health:	$15 \times 4{,}770 = 7.16 \times 10^4\ \mu g/l$	Water, Ecology:	
Land, Health:	$0.2 \times 7.16 \times 10^4 = 1.4 \times 10^4\ \mu g/g$	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 106 = 11.3\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 106 = 8.59\ \mu g/m^3$

$EPC_{WH1} = 15 \times 8.59 = 128.9\ \mu g/l$

$EPC_{WH2} = 0.4 \times 106 = 42.4\ \mu g/l$

$EPC_{LH} = 0.2 \times 42.4 = 8\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A110
3-AMINOPROPENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.8E3		8.6		
Water, $\mu g/l$ (ppm Wt)			7.2E4		42.4		
Land, $\mu g/g$ (ppm Wt)			1.4E4		8		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			8.6		
Water, $\mu g/l$ (ppm Wt)			42.4		
Land, $\mu g/g$ (ppm Wt)			8		

CATEGORY: 10A

PROPANOLAMINES: C_3H_9NO. 10A120

2-AMINO-1-PROPANOL: $CH_3CH(NH_2)CH_2OH$ (2-aminopropylalcohol, β-propanolamine). A liquid with a fishy odor. 10A121

3-AMINO-1-PROPANOL: $H_2NCH_2CH_2CH_2OH$. A colorless liquid with a fishy odor. 10A122

1-AMINO-2-PROPANOL: $CH_3CH(OH)CH_2NH_2$. (2-hydroxy propylamine, isopropanolamine). A liquid with a slight ammonia odor. 10A123

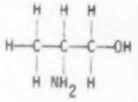
PROPERTIES:

	mol.wt:	mp	bp	d	vap d.	vap.press.	solubility in water
2-amino-1-propanol	75.11		173-6				soluble
3-amino-1-propanol	75.11		187-8	0.982	2.59	2.1 mm at 60°	soluble
1-amino-2-propanol	75.11	1.74	159.46	0.961	2.6		soluble

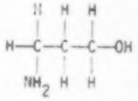
NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2-Amino-1-propanol can be formed by hydrogenation of the ethyl ether of alanine, and as the hydrolytic cleavage product of ergonovine and ergometrinine (ref. 1).

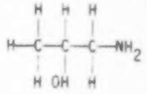
WLN / STRUCTURE:

/


2-amino-1-propanol

Z3Q/


3-amino-1-propanol

Z1YQ/


1-amino-2-propanol

TOXIC PROPERTIES, HEALTH EFFECTS:

The propanolamines are probably irritants.

	LD_{50} oral, rat mg/kg
3-amino-1-propanol	800 (ref. 2)
1-amino-2-propanol	4,260 (ref. 4)

Both 1-amino-2-propanol and 3-amino-1-propanol are absorbed through the skin (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 800 = 3.6 \times 10^4$ µg/m^3

Water, Health: $15 \times 3.6 \times 10^4 = 5.4 \times 10^5$ µg/l

Land, Health: $0.2 \times 5.4 \times 10^5 = 1.1 \times 10^5$ µg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 800 = 85.6$ µg/m^3

$EPC_{AH3} = 0.081 \times 800 = 64.8$ µg/m^3

$EPC_{WH1} = 15 \times 64.8 = 972$ µg/l

$EPC_{WH2} = 0.4 \times 800 = 320$ µg/l

$EPC_{LH} = 0.2 \times 320 = 64$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

10A120
PROPANOLAMINES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E4		65		
Water, $\mu g/l$ (ppm Wt)			5.4E5		320		
Land, $\mu g/g$ (ppm Wt)			1.1E5		64		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			65		
Water, $\mu g/l$ (ppm Wt)			320		
Land, $\mu g/g$ (ppm Wt)			64		

CATEGORY: 10A

BUTYLAMINES: $C_4H_{11}N$ (aminobutanes). 10A140

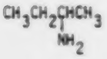
Liquid, ammoniacal odor.

1-AMINOBUTANE: (n-butylamine. 10A141
2-AMINOBUTANE: (secondary butylamine). 10A142
2-AMINO-2-METHYLPROPANE: (tertiary butylamine). 10A143

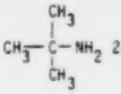
WLN: Z4, ZY2, ZX

STRUCTURE:

$CH_3CH_2CH_2CH_2NH_2$ 1-Aminobutane



$CH_3CH_2CH(NH_2)CH_3$ 2-Aminobutane



$(CH_3)_3C{-}NH_2$ 2-Amino-2-methyl propane

Molecular wt: 73.16; soluble in water.

PROPERTIES:

	mp	bp	d_4^{20}
1-aminobutane	-50	78	
2-aminobutane	-104	63	0.724
2-amino-2-methylpropane	-72.65	44-46	0.695

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Aliphatic amines are strong bases.

The odor of butylamine is slight at less than 1 ppm (ref. 2).

1-Aminobutane has been identified in river water at 1.5 ppb (ref. 8).

TOXIC PROPERTIES, HEALTH EFFECTS:

Contact with liquids, solutions, or vapors of aliphatic amines causes strong, local irritation.

	LD_{50} oral, rat	LC_{Lo} inhalation, rat (ref. 4)
1-aminobutane	500 mg/kg	4,000 ppm/4 hr
2-aminobutane	380 mg/kg	
2-amino-2-methylpropane	180 mg/kg	

The aquatic toxicity rating for 2-amino-2-methylpropane (tert-butylamine) is reported as TLm 96: > 1,000 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 15 mg/m^3 (5 ppm): skin.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $1.5 \times 10^4\ \mu g/m^3$ (5 ppm)
Water, Health: $15 \times 1.5 \times 10^4 = 2.25 \times 10^5\ \mu g/\ell$
Land, Health: $0.2 \times 2.25 \times 10^5 = 4.5 \times 10^4\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5\ \mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 15/420 = 36\ \mu g/m^3$
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 36 = 540\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 15 = 207\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 207 = 41\ \mu g/g$

$EPC_{WE1} = 50 \times >1{,}000 = >50{,}000\ \mu g/\ell$
$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A140
BUTYLAMINES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*†
Air, $\mu g/m^3$ (ppm Vol)			1.5E4 (5)		36 (0.01)		
Water, $\mu g/l$ (ppm Wt)			2.3E5	1.0E5	207	50,000	1.5
Land, $\mu g/g$ (ppm Wt)			4.5E4	2.0E4	40	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			36 (0.01)		
Water, $\mu g/l$ (ppm Wt)			207	50,000	
Land, $\mu g/g$ (ppm Wt)			40	10,000	

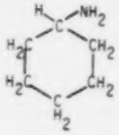
†Level reported for 1-aminobutane in river water.

CATEGORY: 10A

CYCLOHEXYLAMINE: $C_6H_{13}N$ (aminocyclohexane, hexahydroaniline).
A liquid, with a strong, fishy, amine odor. 10A160

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 99.18; mp: -17.7; bp: 134°; d: 0.8191;
pK_a: 10.79 (ref. 2); completely miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Cyclohexylamine is used in organic synthesis, manufacture of insecticides, dry cleaning soaps, and acid gas absorbants (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Vapors of cyclohexylamine are strongly irritating although, at concentrations below 10 ppm, acute effects are absent (ref. 2).

LD_{50} (oral, rat): 710 mg/kg; LC_{Lo} (inhalation, rat): 8,000 ppm for 4 hours.

Cyclohexylamine (as the sulfate) is reported to produce tumors in rats (ref. 4). The EPA/NIOSH ordering number is 4111. The lowest dose (as the sulfate) to induce a carcinogenic response is 11 g/kg. This is equivalent to 5.5 g/kg of cyclohexylamine. The adjusted ordering number is 0.74.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 40 mg/m^3 (10 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 4.0×10^4 $\mu g/m^3$ (10 ppm)
Water, Health: $15 \times 4.0 \times 10^4 = 6.0 \times 10^5$ $\mu g/\ell$
Land, Health: $0.2 \times 6.0 \times 10^5 = 1.2 \times 10^5$ $\mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ $\mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ $\mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 40/420 = 95$ $\mu g/m^3$
$EPC_{AH1a} = 10/420 = 0.024$ ppm
$EPC_{WH1} = 15 \times 95 = 1,430$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 40 = 552$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 552 = 110$ $\mu g/g$

$EPC_{WE1} = 50 \times 100 = 5,000$ $\mu g/\ell$

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10A160
CYCLOHEXYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			4.0E4 (10)		95 (0.024)		
Water, μg/l (ppm Wt)			6.0E5	1.0E4	552	5,000	
Land, μg/g (ppm Wt)			1.2E5	2.0E3	110	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			95 (0.024)		
Water, μg/l (ppm Wt)			552	5,000	
Land, μg/g (ppm Wt)			110	1,000	

REFERENCES: CATEGORY 10A

Amines - Primary Aliphatic Amines and Diamines

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6. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

7. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

8. Neurath, G. B., M. Dünger, F. G. Pein, D. Ambrosius, and O. Schreiber. Primary and Secondary Amines in the Human Environment. Ed. Cosmet. Toxicol., Vol. 15: 275-282 (1977).

CATEGORY 10

AMINES

SUBCATEGORY: 10B - Secondary Aliphatic Amines

Summary of Subcategory

Total number of compounds in subcategory	5
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	1

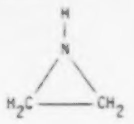
Consent Decree compounds included in subcategory: None

CATEGORY: 108

WLN: T3MTJ

ETHYLENEIMINE: C_2H_5N (aziridine, azacyclopropane). 108020
A colorless liquid; intense, ammoniacal odor; fumes in air.

STRUCTURE:



PROPERTIES:

Molecular wt: 43.07; mp: -73.96; bp: 55-56; d: 0.832;
vap. press.: 160 mm at 20°; vap. d: 1.48; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethyleneimine is an extremely reactive compound; it undergoes ring-opening reactions similar to those undergone by ethylene oxide (ref. 1). Ethyleneimine hydrolyzes in water to give ethanolamine. Etheyleneimine is polymerized to polyethyleneimine, which is used as a flocculant in water treatment. Polyethyleneimine is also used in the paper and textile industries (ref. 2).

The ammoniacal odor of ethyleneimine is detectable at 2 ppm (ref. 3).

Ethyleneimine is not known to occur in nature (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Ethyleneimine is regarded as highly toxic by inhalation, skin contact, and ingestion. It is a potent irritant, causing blisters. Toxic effects due to a 2-3 minute exposure to the vapor were not apparent until after 3 hours (ref. 4).

Ethyleneimine causes chromosome aberrations in mammalian cells (ref. 5). It is reported to cause cancer in mice and in rats, and the animal studies show that a high incidence of hepatomas and pulmonary tumors result from oral administration (ref. 2).

The EPA/NIOSH ordering number is 4212. The lowest toxic dose to induce carcinogenic effect in animals is recorded as 20 mg/kg. The adjusted ordering number is 210.6.

LD_{50} (oral, rat): 15 mg/kg (ref. 6).

LC_{Lo} (inhalation, rat): 25 ppm/8 hr (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1 mg/m^3 (0.5 ppm). (This TLV does not consider the carcinogenic potential of ethyleneimine.)

Ethyleneimine is the subject of a NIOSH Hazard Review Document (ref. 7).

Ethyleneimine is designated by OSHA as a cancer suspect agent; special precautions for exposed workers are prescribed (ref. 8), including monitoring, control methods, and medical surveillance.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/210.6 = 332\ \mu g/m^3$	Air, Ecology:
Water, Health: $15 \times 332 = 5 \times 10^3\ \mu g/\ell$	Water, Ecology:
Land, Health: $0.2 \times 5 \times 10^3 = 1{,}000\ \mu g/g$	Land, Ecology

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1/420 = 2.4\ \mu g/m^3$
$EPC_{AH1a} = 0.5/420 = 0.001$ ppm
$EPC_{WH1} = 15 \times 2.4 = 36\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 1 = 14\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 14 = 2.8\ \mu g/g$
$EPC_{AC2} = 10^3/(6 \times 210.6) = 0.8\ \mu g/m^3$
$EPC_{WC} = 15 \times 0.8 = 12\ \mu g/\ell$
$EPC_{LC} = 0.2 \times 12 = 2.4\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

XX

10B020

ETHYLENEIMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.32E2		0.8		
Water, μg/l (ppm Wt)			5.0E3		12		
Land, μg/g (ppm Wt)			1.0E3		2.4		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			2.4 (0.001)		0.8
Water, μg/l (ppm Wt)			14		12
Land, μg/g (ppm Wt)			2.8		2.4

CATEGORY: 108

DIMETHYLAMINE: C_2H_7N. 108040

A colorless gas with a strong ammoniacal odor.

WLN: 1M1

STRUCTURE:

$(CH_3)_2NH$

PROPERTIES:

Molecular wt: 45.09; bp: 7.4; d: 0.6804^{20}_{4}; vap. press.: 2 atm at 25° (ref. 37); vap. d: 1.55; miscible with water; pK_a: 10.61 (ref. 9).

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Dimethylamine is a normal constituent of human urine (ref. 9). Aliphatic amines are strong bases.

The rural concentration of dimethylamine is reported as 89 ppb (ref. 10). This is equivalent to 163.80 $\mu g/m^3$. This value is probably unduly high because it is representative of an agricultural setting. The odor recognition level is reported as 1.10 mg/m^3 (ref. 11) and the odor threshold as 0.047 ppm or 0.09 mg/m^3 (ref. 12).

Dimethylamine has been found in river water samples in concentrations below 15 ppb (ref. 20).

Dimethylamine occurs in fresh and preserved vegetables, pickles, prepared herring, and coffee in concentrations generally below 10 ppm (ref. 20).

TOXIC PROPERTIES, HEALTH EFFECTS:

Dimethylamine is similar to ammonia in its chemical and toxicological properties. It is a strong irritant to eyes and upper respiratory tract.

LD_{50} (oral, rat): (aqueous solution) 698 mg/kg (ref. 6).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 6).

A concentration of 7 mg/ℓ in water is reported to cause tainting of fish flesh (ref. 13).

There is speculation that secondary amines and nitrite may react after ingestion to form nitrosamines. Several nitrosamines are recognized carcinogens (ref. 19).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 18 mg/m^3 (10 ppm). (This level is established to prevent respiratory irritation. The odor threshold is much lower.)(ref. 4).

Dimethylamine is on second priority chemical list of the Chemical Industry Institute of Toxicology (ref. 18).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.8×10^4 $\mu g/m^3$ (10 ppm)
Water, Health: $15 \times 1.8 \times 10^4 = 2.7 \times 10^5$ $\mu g/\ell$
Land, Health:

Air, Ecology:
Water, Ecology: $100 \times 10 = 1 \times 10^3$ $\mu g/\ell$
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 18/420 = 43\ \mu g/m^3$
$EPC_{AH1a} = 10/420 = 0.024$ ppm
$EPC_{WH1} = 15 \times 43 = 645\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 18 = 248\ \mu g/\ell$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/\ell$
$EPC_{WE2} = 7{,}000\ \mu g/\ell$

MULTIMEDIA ENVIRONMENTAL GOALS

10B040
DIMETHYLAMINE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.8E4 (10)		43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			2.7E5	1.0E3	248	500	<15
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			248	500	
Land, $\mu g/g$ (ppm Wt)					

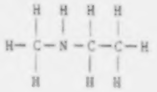
CATEGORY: 10B

ETHYLMETHYLAMINE: C_3H_9N. 10B060

A colorless liquid with an odor similar to ammonia, but more fish-like.

WLN:

STRUCTURE:



$H-\underset{H}{\overset{H}{C}}-\overset{H}{N}-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-H$

PROPERTIES:

Molecular wt: 59.11; bp: 36-7; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Ethylmethylamine is used as a chemical intermediate in the production of pharmaceuticals, dyestuffs, ion exchange resins, and other products. It can be formed by the alkylation of ammonia and by reduction of unsaturated nitrogen compounds. It can be detected using the Kjeldahl procedure (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

For industrial workers, the most important action is the strong local irritation produced by contact with liquid solutions or vapors (ref. 9). Direct local contact with eyes can produce permanent eye damage (ref. 14).

The oxidative dealkylation of secondary amines to aldehydes and dealkylated amines appears to be catalyzed by hepatic cytochrome p-450, and this is a key reaction in the inactivation of ingested amines (ref. 14).

LD_{50} (oral, rat): 540 mg/kg for diethylamine; 698 mg/kg for dimethylamine(ref. 6).

Aquatic toxicity: TLm96: 100-10 for diethylamine and dimethylamine.(ref. 6).

There is speculation that secondary amines and nitrite may react after ingestion to form nitrosamines. Several nitrosamines are recognized carcinogens (ref. 19).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 75 mg/m³ (25 ppm) for diethylamine.
TLV = 18 mg/m³ (10 ppm) for dimethylamine.

*MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1.8×10^4 µg/m³ (10 ppm)	Air, Ecology:
Water, Health: $15 \times 1.8 \times 10^4 = 2.7 \times 10^5$ µg/l	Water, Ecology: $100 \times 10 = 1{,}000$ µg/l
Land, Health: $0.2 \times 2.7 \times 10^5 = 5.4 \times 10^4$ µg/g	Land, Ecology: $0.2 \times 1{,}000 = 200$ µg/g

*ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 18/420 = 43$ µg/m³	
$EPC_{AH1a} = 10/420 = 0.024$ ppm	
$EPC_{WH1} = 15 \times 43 = 645$ µg/l	$EPC_{WE1} = 50 \times 10 = 500$ µg/l
$EPC_{WH2} = 13.8 \times 18 = 248$ µg/g	
$EPC_{LH} = 0.2 \times 248 = 50$ µg/g	$EPC_{LE} = 0.2 \times 500 = 100$ µg/g

*Values based on data for dimethylamine.

MULTIMEDIA ENVIRONMENTAL GOALS

10B060
ETHYLMETHYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.8E4 (10)		43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			2.7E5	1.0E3	248	500	
Land, $\mu g/g$ (ppm Wt)			5.4E4	2.0E2	50	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			43 (0.024)		
Water, $\mu g/l$ (ppm Wt)			248	500	
Land, $\mu g/g$ (ppm Wt)			50	100	

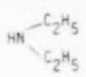
CATEGORY: 10B

DIETHYLAMINE: $C_4H_{11}N$. (Diethamine, N-ethyl-ethanamine). 10B080

A colorless, flammable, hygroscopic liquid with an ammoniacal odor.

WLN: 2M2

STRUCTURE:



Diethylamine

PROPERTIES:

Molecular wt: 73.14; mp: -48; bp: 56.3^{760}; d: 0.7056^{20}_{4}; vap. d: 2.53; vap. press: 400 mm at 38.0°; pKa = 11.00; very soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Diethylamine has been found in samples taken from river water in concentrations below 15 ppb (ref. 20).

It is manufactured from ethanol and ammonia (ref. 16). Uses include the rubber and petroleum industry, and in resins, dyes, and pharmaceuticals (ref. 16).

Diethylamine occurs in spinach, apples, preserved vegetables, pickles, and prepared herring in concentrations generally below 10 ppm (ref. 20).

TOXIC PROPERTIES, HEALTH EFFECTS:

Information obtained from animal studies indicates that diethylamine may cause irritation of the cornea and of lung tissue (ref. 4).

LD_{50} (oral, rat): 540 mg/kg (ref. 6).

Aquatic toxicity: TLm 96: 100-10 ppm (ref. 6).

There is speculation that secondary amines and nitrite may react after ingestion to form nitrosamines. Several nitrosamines are recognized carcinogens (ref. 19).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 75 mg/m^3 (25 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 7.5×10^4 μg/m^3 (25 ppm)

Water, Health: $15 \times 7.5 \times 10^4 = 1.13 \times 10^6$ μg/l

Land, Health: $0.2 \times 1.13 \times 10^6 = 2.26 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ μg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 75/420 = 178.6$ μg/m^3

$EPC_{AH1a} = 25/420 = 0.06$ ppm

$EPC_{WH1} = 15 \times 178.6 = 2{,}679$ μg/l

$EPC_{WH2} = 13.8 \times 75 = 1{,}035$ μg/l

$EPC_{LH} = 0.2 \times 1{,}035 = 200$ μg/g

$EPC_{WE1} = 50 \times 10 = 500$ μg/l

$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

10B080
DIETHYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.5E4 (25)		178.6 (0.06)		
Water, $\mu g/l$ (ppm Wt)			1.13E6	1.0E3	1,035	500	<15
Land, $\mu g/g$ (ppm Wt)			2.3E5	2.0E2	200	100	

*To be multiplied by dilution factor

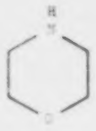
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			178.6 (0.06)		
Water, $\mu g/l$ (ppm Wt)			1,035	500	
Land, $\mu g/g$ (ppm Wt)			200	100	

CATEGORY: 10B

MORPHOLINE: C_4H_9NO (diethyleneimide oxide, tetrahydro-1,4-oxazine, diethylene oximide, diethylene imidoxide). 10B100
A colorless, volatile, hygroscopic liquid with a characteristic amine odor.

WLN: T6M

STRUCTURE:



PROPERTIES:

Molecular wt: 87.12; bp: 128.6; d: 1.0020^{20}; vap. press: 8.0 mm at 20°; pKb = 5.6; soluble in water, volatile with steam.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Morpholine is formed by the condensation of ethylene oxide with ammonia or by dehydrating diethanolamine (ref. 3). It is used as a food additive and is permitted in food for human consumption (ref. 17). It also serves as a cheap solvent; as a corrosion inhibitor; in insecticides, fungicides, and herbicides; and in local anesthetics and antiseptics (ref. 16).

TOXIC PROPERTIES, HEALTH EFFECTS:

Morpholine is corrosive to human skin (ref. 16). Concentrated morpholine readily penetrates the skin. The undiluted compound is very irritating to the eyes, and there is a moderately high degree of hazard by skin contact. Since its solutions are highly alkaline, it is a potent skin and mucous membrane irritant (ref. 3). Lung, kidney, and liver damage has been reported in studies with rats (ref. 4). The hazards of morpholine are similar to other organic bases (ref. 3).

Respiratory tract irritation has been reported in industrial workers (ref. 4).

LD_{50} (oral, rat): 1,050 mg/kg (ref. 6).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 70 mg/m³ (20 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 7.0×10^4 μg/m³ (20 ppm)

Water, Health: $15 \times 7.0 \times 10^4 = 1.05 \times 10^6$ μg/l

Land, Health: $0.2 \times 1.05 \times 10^6 = 2.1 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 70/420 = 166.7$ μg/m³

$EPC_{AH1a} = 20/420 = 0.05$ ppm

$EPC_{WH1} = 15 \times 166.7 = 2,500$ μg/l

$EPC_{WH2} = 13.3 \times 70 = 966$ μg/l

$EPC_{LH} = 0.2 \times 966 = 193$ μg/g

$EPC_{WE1} = 50 \times 100 = 5,000$ μg/l

$EPC_{LE} = 0.2 \times 5,000 = 1,000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

10B100
MORPHOLINE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.0E4 (20)		167 (0.05)		
Water, $\mu g/l$ (ppm Wt)			1.0E6	1.0E4	966	5,000	
Land, $\mu g/g$ (ppm Wt)			2.1E5	2.0E3	193	1,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			167 (0.05)		
Water, $\mu g/l$ (ppm Wt)			966	5,000	
Land, $\mu g/g$ (ppm Wt)			193	1,000	

REFERENCES: CATEGORY 10B

Amines - Secondary Aliphatic Amines

1. Fishbein, L. Chromatography of Environmental Hazards, Vol. 1. Elsevier Publishing Company, Amsterdam (1972).

2. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 9, Lyon, France. A World Health Organization Publication (WHO), Geneva (1975).

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REFERENCES: CATEGORY 10B (Continued)

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18. Chemical Industry Institute of Toxicology. Second Priority List. Chemical Industry Institute of Toxicology: Annual Report. Research Triangle Park, NC (1976).

19. Grasso, P., and C. O'Hare. Carcinogens in Food. Chemical Carcinogens. ACS Monograph 173. C. E. Searle, Ed., American Chemical Society, Washington, DC, pp. 701-728 (1976).

20. Neurath, G. B., M. Dünger, F. G. Pein, D. Ambrosius, and O. Schreiber. Primary and Secondary Amines in the Human Environment. Ed. Cosmet. Toxicol., Vol. 15: 275-282 (1977).

CATEGORY 10

AMINES

SUBCATEGORY: 10C - Aromatic Amines and Diamines

Summary of Subcategory

Total number of compounds in subcategory	21
number of parent compounds with subspecies	2
number of subspecies	12
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	7

Consent Decree compounds included in subcategory: 2

10C140	Benzidine
10C160	3,3'-Dichlorobenzidine

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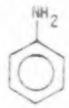
CATEGORY: 10C

WLN: ZR

ANILINE: C_6H_7N (phenylamine, aminobenzene). 10C020
An oily liquid; colorless when freshly distilled, darkens on exposure to air and light; disagreeable odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 93.11; bp: 184.13; d: 1.0217; pk_b: 9.3 (ref. 1).
vap. press.: 1 mm at 34.8° C; volatile with steam; soluble in water, soluble in lipids (ref. 1).

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Aniline was first produced by the dry distillation of indigo. It has also been isolated from coal tar. It has, in general, the characteristics of primary aromatic amines; it is a weak base. It is widely used as an intermediate in the production of chemicals used in dyes, photographic chemicals, pharmaceuticals, and in the rubber industry (ref. 1).

The odor recognition level for aniline is reported as 0.37-4.15 mg/m^3 (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

The biological half-life of aniline is reported as 0.120 day for man (ref. 3). Aniline may be absorbed through the skin as well as through inhalation and cases of acute, as well as chronic, poisoning are reported (ref. 4). The oxygen transport ability of hemoglobin is impaired by aniline; human death has resulted from exposure to high concentrations of aniline (ref. 5). Ingestion of 350 mg/kg has also resulted in human death (ref. 6).

LD_{50} (oral, rat): 440 mg/kg.(ref. 6)

LC_{50} (inhalation, rat): 250 ppm for 4 hours (ref. 6).

There are no adequate data to indicate that aniline is carcinogenic to man or to animals (ref. 1). However, several aniline derivatives have produced oncogenic responses in test animals (ref. 6).

Aquatic toxicity: 96-hour TLm is 100-10 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 19 mg/m^3 (5 ppm) skin.

Aniline is included in the Chemical Industry Institute of Toxicology First Priority Chemicals List (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $1.9 \times 10^4\ \mu g/m^3$ (5 ppm)
Water, Health: $15 \times 1.9 \times 10^4 = 2.85 \times 10^5\ \mu g/m^3$
Land, Health: $0.2 \times 2.85 \times 10^5 = 5.7 \times 10^4\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 10 = 1.0 \times 10^3\ \mu g/\ell$
Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 19/420 = 45\ \mu g/m^3$
$EPC_{AH1a} = 5/420 = .01$ ppm
$EPC_{WH1} = 15 \times 45 = 675\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 19 = 262\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 262 = 52.4\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/\ell$
$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10C020
ANILINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.9E4 (5)		45 (0.02)		
Water, $\mu g/l$ (ppm Wt)			2.9E5	1.0E3	262	500	
Land, $\mu g/g$ (ppm Wt)			5.7E4	2.0E2	52.4	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			45 (0.02)		
Water, $\mu g/l$ (ppm Wt)			262	500	
Land, $\mu g/g$ (ppm Wt)			52.4	100	

CATEGORY: 10C

AMINOTOLUENES: C_7H_9N (methyl anilines, toluidines). 10C040

2-AMINOTOLUENE: light yellow liquid; becomes darker on exposure to air and light. 10C041
3-AMINOTOLUENE: liquid. 10C042
4-AMINOTOLUENE: leaflets, winelike odor, burning taste. 10C043

PROPERTIES:

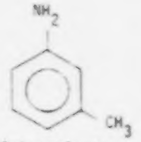
	Molecular wt	mp	bp	d_4^{20}	Solubility in water
2-Aminotoluene	107.16	-14.7	200.23	0.9984	Slightly soluble
3-Aminotoluene	107.16	-30.4	203.35	0.9889	Slightly soluble
4-Aminotoluene	107.16	43.7	200.55	0.9619	Slightly soluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

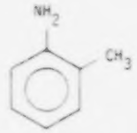
Aminotoluenes are formed by reduction of the corresponding nitrotoluenes.

WLN: ZR B, ZR C, ZR D

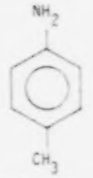
STRUCTURE:



3-Aminotoluene
(m-Toluidine)



2-Aminotoluene
(o-Toluidine)



4-Aminotoluene
(p-Toluidine)

TOXIC PROPERTIES, HEALTH EFFECTS:

Aromatic amines are readily absorbed through the skin. The toxicity of aminotoluenes is considered to be similar to that of aniline (ref. 5). Inhalation of vapor of the ortho isomer results in intoxication and irritation of the kidney and bladder. A concentration of approximately 100 ppm is considered the maximum endurable for an hour without serious consequences (ref. 8).

	LD_{50} (oral, rat)(ref. 6)
2-Aminotoluene	900 mg/kg
3-Aminotoluene	974 mg/kg
4-Aminotoluene	656 mg/kg

Each of the aminotoluenes is reported to produce oncogenic responses in animals (ref. 6). The EPA/NIOSH ordering number, considering the compounds collectively, is 4212, and the lowest dose to produce an oncogenic response is 6,600 μg/kg. The adjusted ordering number for the compounds collectively is 638.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 22 mg/m^3 (5 ppm) for 2-aminotoluene. This TLV does not reflect carcinogenic potential of the aminotoluenes (ref. 4).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/638 = 110$ μg/m^3	Air, Ecology:
Water, Health: $15 \times 110 = 1.65 \times 10^3$ μg/ℓ	Water, Ecology:
Land, Health: $0.2 \times 1.65 \times 10^3 = 330$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 22/420 = 52$ μg/m^3
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 52 = 780$ μg/ℓ
$EPC_{WH2} = 13.8 \times 22 = 304$ μg/ℓ
$EPC_{LH} = 0.2 \times 304 = 60.8$ μg/g
$EPC_{AC2} = 10^3/(6 \times 638) = 0.26$ μg/m^3
$EPC_{WC} = 15 \times 0.26 = 4$ μg/ℓ
$EPC_{LC} = 0.2 \times 4 = 0.8$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X
10C040
AMINOTOLUENES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.1E2		0.26		
Water, μg/l (ppm Wt)			1.65E3		4.0		
Land, μg/g (ppm Wt)			3.30E2		0.8		

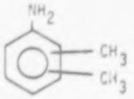
*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			52 (0.01)		0.26
Water, μg/l (ppm Wt)			304		4.0
Land, μg/g (ppm Wt)			61		0.8

CATEGORY: 10C **WLN**: ZR X X

DIMETHYLANILINES: $C_8H_{11}N$ (xylidines, aminodimethylbenzenes).10C060 **STRUCTURE**:



Of the six isomeric xylidines, all except 3,4-xylidine are liquids above 20° C.

2,3-XYLIDINE: (1-amino-2,3-dimethyl benzene, 2,3-dimethyl aniline).10C061
2,4-XYLIDINE: (1-amino-2,4-dimethyl benzene, 2,4-dimethyl aniline).10C062
2,5-XYLIDINE: (2-amino-1,4-dimethyl benzene, 2,5-dimethyl aniline).10C063
2,6-XYLIDINE: (2-amino-1,3-dimethyl benzene, 2,6-dimethyl aniline).10C064
3,4-XYLIDINE: (4-amino-1,2-dimethyl benzene, 3,4-dimethyl aniline).10C065
3,5-XYLIDINE: (1-amino-3,5-dimethyl benzene, 3,5-dimethyl aniline).10C066

PROPERTIES:

	molecular wt	mp	bp	d	solubility in water
2,3-xylidine	121.18	<-15	221.2^{760}	0.9931^{20}	sparingly soluble
2,4-xylidine	121.18	16	214^{760}	0.9723^{20}_{4}	sparingly soluble
2,5-xylidine	121.18	15.5	214^{760}	0.9720^{21}_{4}	sparingly soluble
2,6-xylidine	121.18	11.2	214^{739}	0.9842^{20}	insoluble
3,4-xylidine	121.18	51	226^{760}	1.076^{18}	sparingly soluble
3,5-xylidine	121.18	9.8	220	0.9706^{20}_{4}	sparingly soluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

The six isomeric xylidines may be formed by the reduction of the corresponding nitro compounds. They are used in the manufacture of dyes (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicity of dimethylanilines has been compared to that of aniline and methyl aniline. Depending on the species tested, the xylidines appear to be less toxic, equally toxic, or more toxic than aniline and methyl aniline (reg. 4).

	LD_{50} (oral, rat) (in mg/kg)(ref. 6)
2,3-xylidine	933
2,4-xylidine	467
2,5-xylidine	1,297
2,6-xylidine	840

	LD_{50} (oral, rat) (in mg/kg)(ref. 6)
3,4-xylidine	812
3,5-xylidine	707
xylidine (mixture of isomers)	670

LC_{50} (inhalation, mouse): 149 ppm for 7 hours for mixture of xylidines (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 25 mg/m^3 (5 ppm) skin for xylidines.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.5×10^4 μg/m^3 (5ppm)	Air, Ecology:
Water, Health: $15 \times 2.5 \times 10^4 = 3.75 \times 10^5$ μg/ℓ	Water, Ecology:
Land, Health: $0.2 \times 3.75 \times 10^5 = 7.5 \times 10^4$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 25/420 = 60$ μg/m^3
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 60 = 900$ μg/ℓ
$EPC_{WH2} = 13.8 \times 25 = 345$ μg/ℓ
$EPC_{LH} = 0.2 \times 345 = 69$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

10C060
DIMETHYLANILINES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.5E4 (5)		60 (0.01)		
Water, μg/l (ppm Wt)			3.75E5		345		
Land, μg/g (ppm Wt)			7.5E4		69		

*To be multiplied by dilution factor

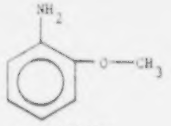
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			60 (0.01)		
Water, μg/l (ppm Wt)			345		
Land, μg/g (ppm Wt)			69		

CATEGORY: 10C

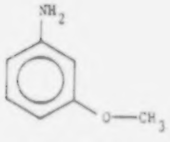
ANISIDINES: C_7H_9ON (methoxyaniline, aminoanisole) 10C080
o-ANISIDINE: (2-amino-anisole). A yellowish liquid, volatile with steam. 10C081
m-ANISIDINE: (m-methoxyaniline. A pale yellow liquid. 10C082
p-ANISIDINE: (4-amino-anisole). A solid crystal. 10C083

WLN:

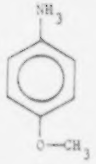
STRUCTURE:



o-Anisidine



m-Anisidine



p-Anisidine

PROPERTIES:

	mol. wt.	mp	bp	d	solubility in water
o-anisidine	123.16	5.2	225	1.0923^{20}_{4}	slightly
m-anisidine	123.16	<-12	251	1.096^{20}_{4}	slightly
p-anisidine	123.16	57.2	243	1.071^{57}_{4}	soluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Anisidines are used in the manufacture of azo dyes (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Workmen exposed to p-anisidine at a concentration of 1.9 mg/m^3 for 3-1/2 hr/day for 6 months complained of headache and vertigo (ref. 4). The o-form is a skin irritant, may cause dermatitis, and can be absorbed through the skin (ref. 8,9).

LD_{50} (oral, rat): 1,400 mg/kg (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.5 mg/m^3 (0.1 ppm) for the o- and p-isomers.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	500 μg/m^3 (0.1 ppm)	Air, Ecology:	
Water, Health:	15 x 500 = 7,500 μg/l	Water, Ecology:	
Land, Health:	0.2 x 7,500 = 1.5 x 10^3 μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.5/420 = 1.19\ \mu g/m^3$

$EPC_{AH1a} = 0.1/420 = 2.4 \times 10^{-4}$ ppm

$EPC_{WH1} = 15 \times 1.19 = 17.9\ \mu g/l$

$EPC_{WH2} = 13.8 \times 0.5 = 6.9\ \mu g/l$

$EPC_{LH} = 0.2 \times 6.9 = 1.38\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

10C080

ANISIDINES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.0E2 (0.1)		1.2 (2.4×10^{-4})		
Water, $\mu g/l$ (ppm Wt)			7.5E3		7		
Land, $\mu g/g$ (ppm Wt)			1.5E3		1.4		

*To be multiplied by dilution factor

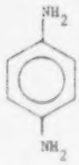
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1.2 (2.4×10^{-4})		
Water, $\mu g/l$ (ppm Wt)			7		
Land, $\mu g/g$ (ppm Wt)			1.4		

CATEGORY: 10C

WLN: ZRDZ

1,4-DIAMINOBENZENE: $C_6H_9N_2$ (p-phenylene-diamine, 4-aminoaniline, 1,4-benzenediamine, p-diaminobenzene). Colorless crystals. 10C100

STRUCTURE:



PROPERTIES:

Molecular wt: 108.15; mp: 140; bp: 267; vap. d: 3.72; vap. press: very low; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,4-Diaminobenzene is used in the fur-dyeing industry when a deep black color is required (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

1,4-Diaminobenzene has caused asthmatic symptoms and other respiratory problems in workers in the fur-dyeing industry. One fatal case is reported of liver involvement due to the para-form. The m- and o-forms are somewhat less toxic than the p-form (ref. 8). It is an especially powerful skin irritant (ref. 8).

LD_{Lo} (oral, rat): 100 mg/kg (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.1 mg/m^3 (0.02 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	100 μg/m^3 (0.02 ppm)	Air, Ecology:
Water, Health:	15 x 100 = 1,500 μg/l	Water, Ecology:
Land, Health:	0.2 x 1,500 = 300 μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.1/420 = 0.24$

$EPC_{AH1a} = 0.02/420 = 4.8 \times 10^{-5}$ ppm

$EPC_{WH1} = 15 \times 0.24 = 3.6$ μg/l

$EPC_{WH2} = 13.8 \times 0.1 = 1.38$ μg/l

$EPC_{LH} = 0.2 \times 1.38 = 0.3 \times 10^{-1}$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

XX
10C100
1,4-DIAMINOBENZENE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E2 (0.02)		0.24 ($5x10^{-5}$)		
Water, $\mu g/l$ (ppm Wt)			1.5E3		1.4		
Land, $\mu g/g$ (ppm Wt)			3.0E2		0.3		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

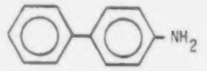
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			0.24 (5×10^{-5})		
Water, $\mu g/l$ (ppm Wt)			1.4		
Land, $\mu g/g$ (ppm Wt)			0.3		

CATEGORY: 10C

WLN: ZR DR

4-AMINOBIPHENYL: $C_{12}H_{11}N$ (p-phenylaniline, 4-biphenylamine).
Colorless crystals that darken on exposure to light and air. 10C120

STRUCTURE:



PROPERTIES:

Molecular wt: 169.24; mp: 50-2; bp: 302; slightly soluble in cold water; volatile in steam; soluble in lipids (ref. 10).

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

4-Aminobiphenyl has, in general, the properties of primary aromatic amines. It is a weak base. The main commercial use of 4-aminobiphenyl in the past was that of an antioxidant in rubber (ref. 10).

4-Aminobiphenyl is a metabolite of 4-nitrobiphenyl (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

A high incidence of bladder carcinomas was reported for a group of workers occupationally exposed to 4-aminobiphenyl (ref. 10). 4-Aminobiphenyl has also caused cancer in animals (ref. 6).

The EPA/NIOSH ordering number is 7526. The lowest toxic dose to induce a carcinogenic response is reported as 140 mg/kg. The adjusted ordering number is 54. (ref. 6).

LD_{50} (oral, rat): 500 mg/kg.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

4-Aminobiphenyl is the subject of a NIOSH Hazard Review Document (ref. 11).

4-Aminobiphenyl is designated by OSHA as a cancer suspect agent; special precautioons for exposed workers are prescribed (ref. 12).

4-Aminobiphenyl is recognized by ACGIH as being potentially carcinogenic to humans. No TLV has been assigned to it.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/54 = 1.3 \times 10^3\ \mu g/m^3$

Water, Health: $15 \times 1.3 \times 10^3 = 2.0 \times 10^4\ \mu g/\ell$

Land, Health: $0.2 \times 2.0 \times 10^4 = 4.0 \times 10^3\ \mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 500 = 53.5\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 500 = 40.5\ \mu g/m^3$

$EPC_{WH1} = 15 \times 40.5 = 608\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 500 = 200\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 200 = 40\ \mu g/g$

$EPC_{AC2} = 10^3/(6 \times 54) = 3\ \mu g/m^3$

$EPC_{WC} = 15 \times 3 = 45\ \mu g/\ell$

$EPC_{LC} = 0.2 \times 45 = 9\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

10C120

4-AMINOBIPHENYL

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.3E3		3		
Water, μg/l (ppm Wt)			2.0E4		45		
Land, μg/g (ppm Wt)			4.0E3		9		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			40.5		3
Water, μg/l (ppm Wt)			200		45
Land, μg/g (ppm Wt)			40		9

CATEGORY: 10C

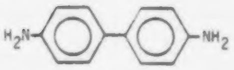
BENZIDINE: $C_{12}H_{12}N_2$ (4,4'-diaminodiphenyl, 4-4'-diphenylenediamine). 10C140
Colorless crystals; darken on exposure to light and air.

PROPERTIES:

Molecular wt: 184.26; mp: 125; bp: 400^{740}; slightly soluble in cold water.

WLN: ZR DR DZ

STRUCTURE:



NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Benzidine has, in general, the characteristics of primary aromatic amines. It is a weak base. Benzidine and its salts are used in the synthesis of dyes (ref. 10).

The compound appears to be resistant to physical and biological degradation. It is sufficiently volatile and soluble to be widely dispersed (ref. 13).

TOXIC PROPERTIES, HEALTH EFFECTS:

Benzidine is believed to be absorbed through the skin as well as through inhalation (ref. 4).

LD_{50} (oral, rat): 309 mg/kg (ref. 6).

A high incidence of bladder tumors among workers handling benzidine is reported (refs. 4, 10). Inhalation of 18 mg/m^3 for 13 years resulted in carcinoma in exposed workers (ref. 6).

The compound is reported to cause cancer in animals also. Cancer resulted in rats exposed intermittently via inhalation to 10 mg/m^3 for 56 weeks (ref. 6). It's salts are also carcinogenic in humans (ref. 11).

The EPA/NIOSH ordering number is 7426. The lowest toxic dose reported to induce a carcinogenic response is 2,100 mg/kg. The adjusted ordering number is 3.5.

Aquatic toxicity: TLm 96: 10-1 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Benzidine production is recognized by ACGIH to be associated with a substance or substances considered potential human carcinogens. No TLV has been assigned. It is suggested that contact by any route be avoided (ref. 4

Benzidine is the subject of a NIOSH Hazard Review Document (ref. 11).

Benzidine is designated by OSHA as a cancer suspect agent; special precautions for exposed workers are prescribed (ref. 12). On EPA's Consent Decree Priority I List.

***MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health: $100 \times 10 = 1.0 \times 10^3$ μg/m
Water, Health: $15 \times 1.0 \times 10^3 = 1.5 \times 10^4$ μg/ℓ
Land, Health: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 1 = 100$ μg/ℓ
Land, Ecology: $0.2 \times 100 = 20$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 309 = 33$ μg/m^3
$EPC_{AH3} = 0.081 \times 309 = 25$ μg/m^3
$EPC_{WH1} = 15 \times 25 = 375$ μg/ℓ
$EPC_{WH2} = 0.4 \times 309 = 124$ μg/ℓ
$EPC_{LH} = 0.2 \times 124 = 24.8$ μg/g
$EPC_{AC1} = 1.0 \times 10^3/420 = 2.4$ μg/m
$EPC_{WC} = 15 \times 2.4 = 36$ μg/ℓ
$EPC_{LC} = 0.2 \times 36 = 7.2$ μg/g

$EPC_{WE1} = 50 \times 1 = 50$ μg/ℓ
$EPC_{LE} = 0.2 \times 50 = 10$ μg/g

*EPC's based on carcinogenicity are based on the $MATE_{AH}$ derived from the lowest effective inhalation concentration.

MULTIMEDIA ENVIRONMENTAL GOALS

X

10C140
BENZIDINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E3		2.4		
Water, $\mu g/l$ (ppm Wt)			1.5E4	1.0E2	36	50	
Land, $\mu g/g$ (ppm Wt)			2.0E3	2.0E1	7	10	

*To be multiplied by dilution factor

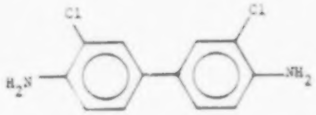
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			25		2.4
Water, $\mu g/l$ (ppm Wt)			124	50	36
Land, $\mu g/g$ (ppm Wt)			24.8	10	7

CATEGORY: 10C

WLN: ZR BG DR DZ CG

3,3'-DICHLOROBENZIDINE: $C_{12}H_{10}Cl_2N_2$ (4,4'-diamino-3,3'-dichlorobiphenyl, o,o'-dichlorobenzidine, 3,3'-dichloro-4,4'-biphenyldiamine, 3,3'-dichloro-4,4'-diaminobiphenyl).
10C160

STRUCTURE:



PROPERTIES:

Molecular wt: 253.13; mp: 132-3; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

3,3'-Dichlorobenzidine superficially appears to be a relatively immobile compound, but it is very similar to DDT. Its basic nature suggests that it may be fairly tightly bound to humic materials in soils (ref. 13).

3,3'-dichlorobenzidine is formed from o-chloronitrobenzene (ref. 9). It is used as a chemical intermediate for the production of dyes and pigments, and as a curing agent for isocyanate-containing compounds (refs. 9, 1).

Changes in the mobility and toxicity of 3,3'-dichlorobenzidine upon entry into salt water appear probable and warrant attention (ref. 13).

TOXIC PROPERTIES, HEALTH EFFECTS:

While 3,3'-dichlorobenzidine is excreted in the urine of monkeys almost unchanged, it undergoes considerable transformation in rats (ref. 13).

LC_{LO} (oral, rat): 4,740 mg/kg (ref. 6).

Although no reports of 3,3'dichlorobenzidine induced cancer in man are known, it may contribute to cases of bladder cancer attributed to benzidine, as both substances may be prepared in the same plant (ref. 1).

Certain animal studies have shown 3,3'-dichlorobenzidine to be more carcinogenic than benzidine, although inhalation is not reported to cause tumors as in the case of benzidine (ref. 4).

The EPA/NIOSH ordering number for 3,3'-dichlorobenzidine is 5,416. The lowest dosage to produce a carcinogenic response is 5,100 mg/kg, and the adjusted ordering number is 1.1.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

The FDA has declared this substance and its salts as carcinogens (ref. 9).

3,3'-Dichlorobenzidine is the subject of a NIOSH Hazard Review Document (ref. 11).

On EPA's Consent Decree Priority I List.

3,3'-Dichlorobenzidine is designated by OSHA as a cancer suspect agent; special precautions for exposed workers are prescribed (ref. 12).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/1.1 = 6.4 \times 10^4$ µg/m^3	Air, Ecology:
Water, Health: $15 \times 6.4 \times 10^4 = 9.6 \times 10^5$ µg/l	Water, Ecology:
Land, Health: $0.2 \times 9.6 \times 10^5 = 1.9 \times 10^5$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 4,740 = 507$ µg/m^3

$EPC_{AH3} = 0.081 \times 4,740 = 384$ µg/m^3

$EPC_{WH1} = 15 \times 384 = 5,760$ µg/l

$EPC_{WH2} = 0.4 \times 4,740 = 1,896$ µg/l

$EPC_{LH} = 0.2 \times 1,896 = 379$ µg/g

$EPC_{AC2} = 10^3/(6 \times 1.1) = 151$ µg/m^3

$EPC_{WC} = 15 \times 151 = 2,265$ µg/l

$EPC_{LC} = 0.2 \times 2,265 = 453$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X

10C160

3,3'-DICHLOROBENZIDINE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.4E4		151		
Water, $\mu g/l$ (ppm Wt)			9.6E5		1,896		
Land, $\mu g/g$ (ppm Wt)			1.9E5		379		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

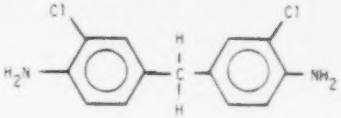
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			384		151
Water, $\mu g/l$ (ppm Wt)			1,896		2,265
Land, $\mu g/g$ (ppm Wt)			379		459

CATEGORY: 10C

4,4'-METHYLENE bis(2-CHLOROANILINE): $C_{13}H_{12}Cl_2N_2$.
(di[4-amino-3-chlorophenyl]methane, 3,3'dichloro-4,4'-diaminodiphenyl methane). 10C180
A colorless crystal.

WLN: ZR BG DIR DZ CG

STRUCTURE:



PROPERTIES:

Molecular wt: 267; mp: 110; vap. press: low; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

4,4'-Methylene bis(2-chloroaniline) resembles DDT both structurally and physically (ref. 13). It is formed by reacting formaldehyde with o-chloroaniline (ref. 14). It is used as a curing agent for polyeurethane elastomers, isocyanate-containing polymers, and for epoxy and epoxy-urethane resin blends (ref. 12).

Analytical techniques for quantifying the amount of 4,4'methylene bis(2-chloroaniline) in working atmospheres and in the urine of workers handling this compound have recently been developed (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

In chemical plant operators, the major source of absorption of 4,4'-methylene bis(2-chloroaniline) was via skin contact (ref. 8). Absorption through the skin is usually more important than inhalation in industrial settings (ref. 13).

LD_{50} (oral, rat): 2,100 mg/kg (ref. 13).

4,4'-Methylene bis(2-chloroaniline) has been reported to cause cancer in rats. The EPA/NIOSH ordering number is 4,112. The lowest dosage to produce an oncogenic response in animals is 2,500 mg/kg, and the adjusted ordering number is 1.65.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.218 mg/m³ (0.02 ppm) to prevent systemic effects. The compound is designated by the ACGIH as an Industrial Substance Suspect of Carcinogenic Potential for Man (ref. 4).

4,4'-Methylene bis(2-chloroaniline) is the subject of a NIOSH Hazard Review Document (ref. 11).

Designated by OSHA as a Cancer Suspect Agent. Special precautions for exposed workers are prescribed (ref. 12).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$10^3 \times 0.218 = 218$ µg/m³	Air, Ecology:
Water, Health:	$15 \times 218 = 3{,}270$ µg/l	Water, Ecology:
Land, Health:	$0.2 \times 3{,}270 = 654$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.218/420 = 0.52$ µg/m³

$EPC_{AH1a} = 0.02/420 = 4.8 \times 10^{-5}$ ppm

$EPC_{WH1} = 15 \times 0.52 = 7.8$ µg/l

$EPC_{WH2} = 13.8 \times 0.218 = 3$ µg/l

$EPC_{LH} = 0.2 \times 3 = 0.6$ µg/g

$EPC_{AC2} = 10^3/(6 \times 1.65) = 101$ µg/m³

$EPC_{WC} = 15 \times 101 = 1{,}515$ µg/l

$EPC_{LC} = 0.2 \times 1{,}515 = 303$ µg/g

X

10C180

4,4'-METHYLENE BIS(2-CHLOROANILINE)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.18E2		0.52 (5×10^{-5})		
Water, μg/l (ppm Wt)			3.27E3		3		
Land, μg/g (ppm Wt)			6.54E2		0.6		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			0.52 (5×10^{-5})		101
Water, μg/l (ppm Wt)			3		1,515
Land, μg/g (ppm Wt)			0.6		303

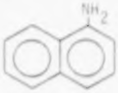
CATEGORY: 10C

WLN: L66J BZ

1-AMINONAPHTHALENE: $C_{10}H_9N$ (1-naphthylamine, α-Naphthylamine). 10C200

White crystals; darken on exposure to light and air.

STRUCTURE:



PROPERTIES:

Molecular wt: 143.19; mp: 50; sublimes; bp: 300; d: 1.1229^{25}_{25};
vap. press.: 1 mm at 104° C; soluble to 0.167 percent in H_2O at 25°; volatile in steam.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1-Aminonaphthalene does not occur as such in nature, but has been isolated from coal tar (ref. 1). It has, in general, the characteristics of primary aromatic amines. It is a weak base.

TOXIC PROPERTIES, HEALTH EFFECTS:

Exposure to 1-aminonaphthalene contaminated with 4-10 percent 2-aminonaphthalene is associated with human bladder cancer (ref. 1). The metabolite, N-hydroxy-1-naphthalene, has also been shown to be carcinogenic (ref. 11). Animal studies indicate the compound is less carcinogenic than the 2-isomer aminonaphthalene .

The EPA/NIOSH ordering number for 1-aminonaphthalene is 3101. The lowest toxic dose to induce an oncogenic response is 25 mg/kg. The adjusted ordering number is 124.

LD_{50} (oral, rat): 779 mg/kg.

Aquatic toxicity: TLm 96: 10-1 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

1-Aminonaphthalene is the subject of a NIOSH Hazard Review Document (ref. 11).

OSHA standards dealing with exposure of employees to 1-aminonaphthalene have been established, taking into consideration evidence that 1-aminonaphthalene may cause cancer (ref. 12).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/124 = 564\ \mu g/m^3$
Water, Health: $15 \times 564 = 8.5 \times 10^3\ \mu g/\ell$
Land, Health: $0.2 \times 8.5 \times 10^3 = 1{,}700\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 1 = 100\ \mu g/\ell$
Land, Ecology: $0.2 \times 100 = 20\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 779 = 83\ \mu g/m^3$
$EPC_{AH3} = 0.081 \times 779 = 63\ \mu g/m^3$
$EPC_{WH1} = 15 \times 63 = 946\ \mu g/\ell$
$EPC_{WH2} = 0.4 \times 779 = 312\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 312 = 62.4\ \mu g/g$
$EPC_{AC2} = 10^3/(6 \times 124) = 1.3\ \mu g/m^3$
$EPC_{WC} = 15 \times 1.3 = 20\ \mu g/\ell$
$EPC_{LC} = 0.2 \times 20 = 4\ \mu g/g$

$EPC_{WE1} = 50 \times 1 = 50\ \mu g/\ell$
$EPC_{LE} = 0.2 \times 50 = 10\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

10C200

1-AMINONAPTHALENE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.64E2		1.3		
Water, $\mu g/l$ (ppm Wt)			8.5 E3	1.0E2	20	50	
Land, $\mu g/g$ (ppm Wt)			1.7E3	2.0E1	4	10	

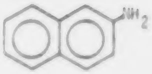
*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			63		1.3
Water, $\mu g/l$ (ppm Wt)			312	50	20
Land, $\mu g/g$ (ppm Wt)			62.4	10	4

CATEGORY: 10C

WLN: L66J CZ

STRUCTURE:



2-AMINONAPHTHALENE: $C_{10}H_9N$ (2-naphthylamine, β-naphthylamine). 10C220

White crystals that darken on exposure to light and air; volatile with steam.

PROPERTIES:

Molecular wt: 143.19; mp: 113; bp: 306; d: 1.0614^{98}_{4}; vap. press.: 1 mm at 108° C; volatile in steam; slightly soluble in cold water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

2-Aminonaphthalene does not occur as such in nature, but is formed by the pyrolysis of nitrogen-containing organic matter. It has been isolated from coal-tar (ref. 1). It has, in general, the characteristics of primary aromatic amines. It is a weak base.

TOXIC PROPERTIES, HEALTH EFFECTS:

Epidemiological studies have shown that occupational exposure to 2-aminonaphthalene is strongly associated with the occurrence of bladder cancer. There is no doubt that the compound is a human bladder carcinogen (ref. 1). 2-Aminonaphthalene is also reported to cause cancer in several animal species.

The EPA/NIOSH ordering number is 7628. The lowest dose to induce a carcinogenic response is reported as 18 mg/kg. The adjusted ordering number is 423.8.

LD_{50} (oral, rat): 727 mg/kg.

Aquatic toxicity: TLm 96: 10-1 ppm (ref. 6).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

2-Aminonaphthalene is recognized by ACGIH as a carcinogenic agent in humans. No TLV has been assigned.

2-Aminonaphthalene was the subject of a NIOSH Hazard Review Document (ref. 11).

OSHA standards dealing with exposure of employees to 2-aminonaphthalene has been established taking into consideration substantial evidence that 2-aminonaphthalene is known to cause cancer (ref. 12).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/423.8 = 165\ \mu g/m^3$
Water, Health: $15 \times 165 = 2.5 \times 10^3\ \mu g/\ell$
Land, Health: $0.2 \times 2.5 \times 10^3 = 500\ \mu g/g$

Air, Ecology:
Water, Ecology: $100 \times 1 = 100\ \mu g/\ell$
Land, Ecology: $0.2 \times 100 = 20\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 727 = 78\ \mu g/m^3$
$EPC_{AH3} = 0.081 \times 727 = 59\ \mu g/m^3$
$EPC_{WH1} = 15 \times 59 = 890\ \mu g/\ell$
$EPC_{WH2} = 0.4 \times 727 = 291\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 291 = 58.2\ \mu g/g$
$EPC_{AC2} = 10^3/(6 \times 423.8) = 0.4\ \mu g/m^3$
$EPC_{WC} = 15 \times 0.4 = 6\ \mu g/\ell$
$EPC_{LC} = 0.2 \times 6 = 1.2\ \mu g/g$

$EPC_{WE1} = 50 \times 1 = 50\ \mu g/\ell$
$EPC_{LE} = 0.2 \times 100 = 20\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X
10C220
2-AMINONAPTHALENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			1.65E2		0.4		
Water, μg/l (ppm Wt)			2.5E3	1.0E2	6.0	50	
Land, μg/g (ppm Wt)			5.0E2	2.0E1	1	20	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			59		0.4
Water, μg/l (ppm Wt)			291	50	6.0
Land, μg/g (ppm Wt)			58	20	1

REFERENCES: CATEGORY 10C

Amines - Aromatic Amines and Diamine

1. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 4, Lyon, France. A World Health Organization (WHO), Geneva (1974).

2. Bond, R. G., C. P. Straub, and R. Prober, Eds. Handbook of Environmental Control. Vol. 1: Air Pollution. The Chemical Rubber Co., Cleveland, OH (1972).

3. Handy, R., and A. Schindler. Estimation of Permissible Concentration of Pollutants for Continuous Exposure. Prepared by Research Triangle Institute under Contract 68-02-1325 for Environmental Protection Agency, Research Triangle Park, NC, EPA-600 12-76-155 (1976).

4. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

5. Hamblin, D. O. Aromatic Nitro and Amino Compounds. *Industrial Hygiene and Toxicology*, *Second Revised Edition*, *Vol. 2*, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

6. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

7. Chemical Industry Institute of Toxicology. First Priority Chemicals. Chemical Industry Institute of Toxicology: Annual Report. Research Triangle Park, NC (1976).

8. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

9. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

10. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 1, Lyon, France. A World Health Organization Publication (WHO), Geneva (1972).

11. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

12. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29 Code Federal Regulations, Part 1910.

13. Radding, S. B., et al. Review of the Environmental Fate of Selected Chemicals. Prepared by Stanford Research Institute under contract 68-01-2681 for Office of Toxic Substances, Environmental Protection Agency, Washington, DC. EPA 560/4-75-001 (1977).

14. Clayson, D. B., and R. C. Garner. Carcinogenic Aromatic Amines and Related Compounds. Chemical Carcinogens. ACS Monograph 173. C. E. Searle, Ed., American Chemical Society, Washington, D.C. (1976).

CATEGORY 10

AMINES

SUBCATEGORY: 10D - Tertiary Amines (Alkyl, Aryl)

Summary of Subcategory

Total number of compounds in subcategory	1
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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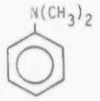
CATEGORY: 10D

WLN: 1N1&R

STRUCTURE:



N,N-DIMETHYLANILINE: $C_8H_{11}N$ (dimethylphenylamine). An oily liquid. 10D020

PROPERTIES:

Molecular wt: 121.18; bp: 194.15; d: 0.9557; slightly soluble in water; soluble in lipids.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

N,N-Dimethylaniline is used as a solvent and in the manufacture of certain dyes (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

N,N-Dimethylaniline induces toxic responses through inhalation or by absorption through the skin (refs. 2,3). The toxic effect is considered similar to that of aniline (ref. 2). Ingestion of 50 mg/kg has resulted in human death (ref. 4).

LD_{50} (oral, rat): 1,410 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 25 mg/m^3 (5 ppm) skin.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.5×10^4 $\mu g/m^3$ (5ppm)
Water, Health: $15 \times 2.5 \times 10^4 = 3.75 \times 10^5$ $\mu g/\ell$
Land, Health: $0.2 \times 3.75 \times 10^5 = 7.5 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 25/420 = 60\ \mu g/m^3$
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 60 = 900\ \mu g/\ell$
$EPC_{WH2} = 13.8 \times 25 = 345\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 345 = 70\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

10D020
N,N-DIMETHYLANILINE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.5E4 (5)		60 (0.01)		
Water, μg/l (ppm Wt)			3.75E5		345		
Land, μg/g (ppm Wt)			7.5E4		70		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			60 (0.01)		
Water, μg/l (ppm Wt)			345		
Land, μg/g (ppm Wt)			70		

REFERENCES: CATEGORY 10D

Amines - Tertiary Amines (Alkyl, Aryl)

1. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

2. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

3. Hamblin, D. O. Aromatic Nitro and Amino Compounds. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

4. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

CATEGORY 11

AZO COMPOUNDS, HYDRAZINE DERIVATIVES

SUBCATEGORY: 11A - Azo Compounds

Summary of Subcategory

Total number of compounds in subcategory	2
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: None

CATEGORY: 11A

WLN: NNU1 &2/1

STRUCTURE:

$H_2C = N = N$

DIAZOMETHANE: CH_2N_2 (diazirine, azimethylene).
A yellow gas; musty odor. 11A020

PROPERTIES:

Molecular wt: 42.05; mp: -145; bp: -23°
(ref. 1); decomposes in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Diazomethane is considered a hazardous chemical due to its instability toward heat, shock, and oxidizing agents. Because of its explosive nature and its toxicity, diazomethane is generated and used in situ when needed as a reagent (ref. 1,2).

Photolysis of diazomethane yields nitrogen and the very reactive diradical methylene.

Diazomethane is not known to occur in nature (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Diazomethane is a highly toxic compound; its toxicity is comparable to that of phosgene. Skin irritation, chest discomfort, asthmatic symptoms, and development of hypersensitivity has been reported by chemists working with diazomethane (ref. 1,2,3). Exposure to high concentrations of diazomethane have resulted in human death (ref. 1).

LC_{Lo}(inhalation, cat): 175 ppm for 10 minutes (ref. 4).

Exposure to diazomethane is reported to cause oncogenic responses in animals. The EPA/NIOSH ordering number is 4223. The lowest dose to induce an oncogenic response is reported as 54 mg/kg. The adjusted ordering number is 78.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.4 mg/m^3 (0.2 ppm). This TLV does not recognize oncogenic potential of diazomethane.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 4×10^2 µg/m^3 (0.2 ppm)
Water, Health: $15 \times 4 \times 10^2 = 6 \times 10^3$ µg/ℓ
Land, Health:

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.4/420 = 1$ µg/m^3
$EPC_{AH1a} = 0.2/420 = 0.0005$ ppm
$EPC_{WH1} = 15 \times 1 = 15$ µg/ℓ
$EPC_{WH2} = 13.8 \times 0.4 = 5.5$ µg/ℓ

$EPC_{AC2} = 10^3/(6 \times 78) = 2$ µg/m^3
$EPC_{WC} = 15 \times 2 = 30$ µg/ℓ

MULTIMEDIA ENVIRONMENTAL GOALS

XX
11A020
DIAZOMETHANE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			4.0E2 (0.2)		1 (0.0005)		
Water, μg/l (ppm Wt)			6.0E3		5.5		
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

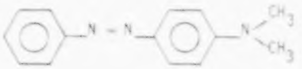
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			1 (0.0005)		2
Water, μg/l (ppm Wt)			5.5		30
Land, μg/g (ppm Wt)					

CATEGORY: 11A

p-DIMETHYLAMINOAZOBENZENE: $C_{14}H_{15}N_3$ (butter or methyl yellow, 4-dimethylaminoazobenzene, N,N-Dimethyl-4-(phenylazo)benzenamine. Yellow leaflets. 11A040

WLN: 1N1&R DNUNR

STRUCTURE:



PROPERTIES:

Molecular wt.: 225.3; mp: 114-117; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

p-Dimethylaminoazobenzene is an azo dye manufactured almost exclusively for its use as a coloring agent. It is not known to occur in nature (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

Contact dermatitis has been observed in factory workers exposed to p-dimethylaminoazobenzene (ref. 5).

LD_{50} (oral, rat): 200 mg/kg (ref. 4).

Exposure to p-dimethylaminoazobenzene is reported to cause cancer in animals. In fact, it is one of the most extensively studied chemical carcinogens (ref. 5).

The EPA/NIOSH ordering number is 5425. The lowest dose to induce a carcinogenic response is 155 mg/kg. The adjusted ordering number is 35. Azo dyes carcinogenesis is affected by dietary factors and by hormones (ref. 6).

The compound is also demonstrated to be teratogenic in the rat at a dosage of 200 to 700 mg/kg (ref. 7). The EPA/NIOSH ordering number based on teratogenicity is 4101. The adjusted ordering number is 20.5.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

P-Dimethylaminoazobenzene is the subject of a NIOSH Hazard Review Document (ref. 8).

P-Dimethylaminoazobenzene is designated by OSHA as a cancer-suspect agent; special precautions for exposed workers are prescribed (ref. 9).

FDA has declared p-dimethylaminoazobenzene a carcinogen (ref. 10).

Considered unsafe for use in food by FAO/WHO (ref. 5).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/35 = 2.0 \times 10^3$ μg/m^3
Water, Health: $15 \times 2 \times 10^3 = 3.0 \times 10^4$ μg/ℓ
Land, Health: $0.2 \times 3.0 \times 10^4 = 6.0 \times 10^3$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 200 = 21.4$ μg/m^3
$EPC_{AH3} = 0.081 \times 200 = 16.2$ μg/m^3
$EPC_{WH1} = 15 \times 16.2 = 243$ μg/ℓ
$EPC_{WH2} = 0.4 \times 200 = 80$ μg/ℓ
$EPC_{LH} = 0.2 \times 80 = 16$ μg/g
$EPC_{AC2} = 10^3/(6 \times 35) = 5$ μg/m^3
$EPC_{WC} = 15 \times 5 = 75$ μg/ℓ
$EPC_{LC} = 0.2 \times 75 = 15$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07A120
METHYLBUTANALS

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.9E5		694		
Water, $\mu g/l$ (ppm Wt)			5.9E6	1.0E3	3,428	500	
Land, $\mu g/g$ (ppm Wt)			1.2E6	2.0E2	686	100	

*To be multiplied by dilution factor

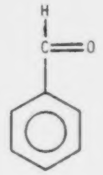
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			694		
Water, $\mu g/l$ (ppm Wt)			3,428	500	
Land, $\mu g/g$ (ppm Wt)			686	100	

CATEGORY: 7A

WLN: VHR

BENZALDEHYDE: C_7H_6O (phenylaldehyde, benzenecarbinal, benzoic aldehyde). 07A140.
A colorless liquid; bitter almond odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 106.13; mp: -26; bp: 178.1; d: 1.043^{25}; vap. d: 3.65; vap. press.: 1 mm at 26.2°; sparingly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Occurs in kernels of bitter almonds (ref. 12). Used as synthetic flavoring substance (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Benzaldehyde acts as a weak local anesthetic. It is narcotic in high concentrations and may cause dermatitis (ref. 12).

LD_{50} (oral, rat): 1,300 mg/kg.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 1{,}300 = 5.85 \times 10^4$ μg/m^3
Water, Health: $15 \times 5.85 \times 10^4 = 8.8 \times 10^5$ μg/ℓ
Land, Health: $0.2 \times 8.8 \times 10^5 = 1.8 \times 10^5 =$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}300 = 140$ μg/m^3
$EPC_{AH3} = 0.081 \times 1{,}300 = 105$ μg/m^3
$EPC_{WH1} = 15 \times 105 = 1{,}580$ μg/ℓ
$EPC_{WH2} = 0.4 \times 1{,}300 = 520$ μg/ℓ
$EPC_{LH} = 0.2 \times 520 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07A140
BENZALDEHYDE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.85E4		105		
Water, $\mu g/l$ (ppm Wt)			8.8E5		520		
Land, $\mu g/g$ (ppm Wt)			1.8E5		100		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			105		
Water, $\mu g/l$ (ppm Wt)			520		
Land, $\mu g/g$ (ppm Wt)			100		

REFERENCES: CATEGORY 7A

Aldehydes, Ketones - Aldehydes

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REFERENCES: CATEGORY 7A (Continued)

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14. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Formaldehyde. Available from National Technical Information Service, Springfield, VA. PB 274 805 (1977).

CATEGORY 7

ALDEHYDES, KETONES

SUBCATEGORY: 7B - Ketones

Summary of Subcategory

Total number of compounds in subcategory	8
number of parent compounds with subspecies	1
number of subspecies	2
Number of parent compounds with no MEG values	1
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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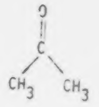
CATEGORY: 7B

ACETONE: C_3H_6O (dimethylketone, 2-propanone) 07B020

A water-clear, bitter tasting, extremely flammable highly volatile liquid.

WLN: 1V1

STRUCTURE:



PROPERTIES:

Molecular wt: 58.08; mp: -95.6; bp: 56.1; d: 0.7899; vap d: 2.00
vap. press: 226.3 mm Hg at 25°; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Concentration in rural atmosphere is reported as 5.2 to 20.9 ppbc (ref. 1), or 0.004 to 0.017 μg/m³. It has been reported in samples taken from freshwater, including wells, lakes, rivers, and groundwater (ref. 2). It has been reported in U.S. drinking water 42 times, the higest concentration being 1.0 μg/l (ref. 3).

Found in emissions from wood burning operations (ref. 4). It is used as an industrial solvent and chemical intermediate (ref. 5). It can be found in the fermentation of corn products (ref. 5).

The odor threshold is reported as 100 ppm (ref. 6).

TOXIC PROPERTIES, HEALTH EFFECTS:

At 3,000 ppm it causes minor irritation to the eyes and nose (ref. 7). Acetone may produce local dermatitis due to defatting action on the skin of workers (ref. 8). Inhaling high concentrations may cause narcosis (ref. 9). A fatal acetone poisoning of a 12-yr old girl occurred when she wore a damp acetone dressing (ref. 7). No ill effects were reported for humans who were administered doses, orally, of 15 to 20 grams per day for several days (ref. 7).

Because of its solubility in water, acetone is readily absorbed into the bloodstream and rapidly spread throughout the body. In studies on humans, it was found that about 70 percent of breathed acetone was absorbed and about 30 percent released with expired air (ref. 5).

LD_{50} (oral, rat): 8,453 mg/kg (ref. 9).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 10).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 2,400 mg/m^3 (1,000 ppm).

Acetone is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 590 mg/m^3 (250 ppm) as a time-weighted average (ref. 18).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 5.9×10^5 μg/m^3 (250 ppm)

Water, Health: $15 \times 5.9 \times 10^5 = 8.9 \times 10^6$ μg/l

Land, Health: $0.2 \times 8.9 \times 10^6 = 1.8 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times >1{,}000 = >1.0 \times 10^5$ μg/l

Land, Ecology: $0.2 \times >1.0 \times 10^5 => 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 590/420 = 1{,}405$ μg/m^3

$EPC_{AH1a} = 250/420 = 0.6$ ppm

$EPC_{WH1} = 15 \times 1{,}405 = 21{,}070$ μg/l

$EPC_{WH2} = 13.8 \times 590 = 8{,}140$ μg/l

$EPC_{LH} = 0.2 \times 8{,}140 = 1{,}630$ μg/g

$EPC_{WE1} = 50 \times > 1{,}000 = > 5.0 \times 10^4$ μg/l

$EPC_{LE} = 0.2 \times >5.0 \times 10^4 = >1.0 \times 10^4$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B020
ACETONE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.9E5 (250)		1,405 (0.6)		0.004-0.017
Water, $\mu g/l$ (ppm Wt)			8.9E6	1.0E5	8,140	50,000	1.0†
Land, $\mu g/g$ (ppm Wt)			1.8E6	2.0E4	1,630	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,405 (0.6)		
Water, $\mu g/l$ (ppm Wt)			8,140	50,000	
Land, $\mu g/g$ (ppm Wt)			1,630	10,000	

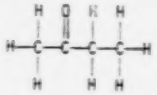
†Public drinking water.

CATEGORY: 7B

BUTANONE: C_4H_8O (methyl ethyl ketone, M.E.K., 2-butanone) 07B060.
A colorless liquid with an acetone-like odor; highly flammable.

WLN: 2V1

STRUCTURE:



PROPERTIES:

Molecular wt: 72.12; mp: -86.35; bp: 79.6^{760}; d: 0.8054^{20}_{4}; vap.d: 2.41; vap. press: 71.2 mm at 20°; soluble in four parts water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Butanone is a byproduct of the distillation of wood (ref. 5). It is used as an industrial solvent and in the manufacturing of cosmetics (ref. 7).

Butanone has been reported in freshwater in five U.S. cities, and in finished drinking water 16 times. (ref. 2).

Odor threshold for butanone is reported as 10 ppm (ref. 6).

TOXIC PROPERTIES, HEALTH EFFECTS:

Threshold for eye and nose irritation is 200 ppm for 50 percent unacclimated individuals (ref. 5). Dermatitis may result upon prolonged skin contact (ref. 5). Dermatitis is common among workers exposed either to the vapors or liquid (ref. 5). At 300 to 600 ppm workers complained of numbness of the fingers and arms (ref. 4). Although absorption of butanone through the skin may occur, toxicity is reported low by this route. Because it is less soluble than acetone in blood, it is more rapidly excreted through the lungs (ref. 5).

LD_{50} (oral, rat): 3,400 mg/kg (ref. 10).

LC_{50} (inhalation, mouse): 205,000 mg/m³ for 45 minutes (ref. 16).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 10).

Experimental evidence indicates that butanone is a teratogenic agent in rats (ref. 2). The EPA/NIOSH ordering number based on teratogenicity is 4,121. The lowest dose to induce a teratogenic response is 1,000 ppm for 10 days. This is equivalent to 2,944 mg/m³. Assuming absorption of the total amount of contaminant in the breathing volume, this concentration over 10 days corresponds to a dosage of 27,387 mg/kg. (The weight of the rat is estimated as 113 g and tidal breathing rate as 0.073 l/min.) (refs. 2, 11). Adjusted ordering number is 0.15.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 590 mg/m³ (200 ppm).

On second priority candidate chemical list for the Chemical Industry Institute of Toxicology (ref. 12).

Butanone (methyl ethyl ketone) is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 590 mg/m³ as a time-weighted average (ref. 18).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 590 = 5.9 \times 10^5$ μg/m³ (200 ppm)

Water, Health: $15 \times 5.9 \times 10^5 = 8.85 \times 10^6$ μg/l

Land, Health: $0.2 \times 8.85 \times 10^5 = 1.77 \times 10^6$ μg/g

Air, Ecology:

Water, Ecology: $100 \times > 1{,}000 = > 1.0 \times 10^5$ μg/l

Land, Ecology: $0.2 \times > 1.0 \times 10^5 = > 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 590/420 = 1{,}405$ μg/m³

$EPC_{AH1a} = 200/420 = 0.48$ ppm

$EPC_{WH1} = 15 \times 1{,}405 = 2.1 \times 10^4$ μg/l

$EPC_{WH2} = 13.8 \times 590 = 8{,}142$ μg/l

$EPC_{LH} = 0.2 \times 8{,}142 = 1{,}630$ μg/g

$EPC_{WE1} = 50 \times > 1{,}000 = > 5.0 \times 10^4$ μg/l

$EPC_{LE} = 0.2 \times > 5.0 \times 10^4 = > 10{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B060 BUTANONE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.9E5 (200)		1,405 (0.48)		
Water, $\mu g/l$ (ppm Wt)			8.85E6	1.0E5	8,142	50,000	
Land, $\mu g/g$ (ppm Wt)			1.77E6	2.0E4	1,630	10,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,405 (0.48)		
Water, $\mu g/l$ (ppm Wt)			8,142	50,000	
Land, $\mu g/g$ (ppm Wt)			1,630	10,000	

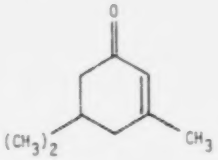
CATEGORY: 7B

WLN: L6V BUTJ C D D

ISOPHORONE: $C_9H_{14}O$ (isoacetophorone, 3,5,5-trimethyl-2-cyclohexene-1-one). 07B080

A water-white liquid; peppermint odor.

STRUCTURE:



PROPERTIES:

Molecular wt: 138.09; bp: 215.2; mp: -8.1; d: 0.9229; vap. press.: .44 mm at 25°; vap. d: 4.77; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Due to its low volatility, isophorone is not a dangerous industrial hazard (ref. 5). Concentrations of 9.5 µg/ℓ of isophorone have been found in samples from public drinking water supplies (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Isophorone is one of the most toxic of the ketones. It is an irritant at 25 ppm or 141 mg/m^3. In high concentrations, isophorone is a kidney poison (ref. 8). Concentrations of 5-8 ppm for a month are reported to cause fatigue and malaise (ref. 7).

LD_{50} (oral, rat): 2,330 mg/kg.

LD_{Lo} (inhalation, rat): 1,840 ppm for 4 hours

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV: 25 mg/m^3 (5 ppm).

On EPA Consent Decree Priority III List.

Isophorone is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 23 mg/m^3 or 5 ppm as a time-weighted average (ref. 18).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 25 = 2.5 \times 10^4$ µg/m^3 (5 ppm)	Air, Ecology:
Water, Health: $15 \times 2.5 \times 10^4 = 3.75 \times 10^5$ µg/ℓ	Water, Ecology:
Land, Health: $0.2 \times 3.75 \times 10^5 = 7.5 \times 10^4$ µg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 25/420 = 60$ µg/m^3

$EPC_{AH1a} = 5/420 = 0.01$ ppm

$EPC_{WH1} = 15 \times 60 = 900$ µg/ℓ

$EPC_{WH2} = 13.8 \times 25 = 345$ µg/ℓ

$EPC_{LH} = 0.2 \times 345 = 69$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B080
ISOPHORONE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			2.5E4 (5)		60 (0.01)		
Water, $\mu g/l$ (ppm Wt)			3.75E5		345		9.5†
Land, $\mu g/g$ (ppm Wt)			7.5E4		69		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			60 (0.01)		
Water, $\mu g/l$ (ppm Wt)			345		
Land, $\mu g/g$ (ppm Wt)			69		

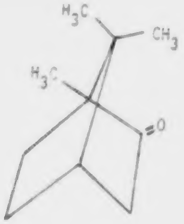
†Public drinking water supplies.

CATEGORY: 7B

CAMPHOR: $C_{10}H_{16}O$ (1,7,7-Trimethylbicyclo [2.2.1] heptan-2-one, d-2-camphonone, formosa camphor, 2-camphonone, 2-oxo-bovane, 2-bornanone). 07B100
A transparent, white crystal with penetrating odor and pungent taste.

WLN: L55 A CVTJ A A B

STRUCTURE:



PROPERTIES:

Molecular wt: 152.23; mp: 179.8; sublimes at 204^{760}; d: 0.990^{25}_{4}; vap.d: 5.24; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Camphor is associated with all parts of the camphor tree (ref. 9). It has been reported in samples taken from finished drinking water supplies (ref. 2). The highest reported concentration in drinking water is 0.5 μg/l (ref. 3). It has also been reported in well water and river water (ref. 2).

Camphor is used in manufacturing plastics, in moth repellant, in embalming fluids, and as a preservative in pharmaceuticals and cosmetics (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Locally, camphor is an irritant. When taken internally, it causes nausea (ref. 8). One human death resulted from inhalation of heated camphor vapor (ref. 7). Although no effects were observed when workers were exposed daily to 2 ppm camphor, prolonged inhalation of 6 mg/m³ may cause severe injury to animals (ref. 7).

LD_{Lo} (intraperitoneal, rat): 900 mg/kg (ref. 8)

Aquatic toxicity: LC_{50}, 96-hour: 110 mg/ℓ (ref. 17)

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 12 mg/m^3 (2 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 12 = 1.2 \times 10^4$ μg/m^3 (2 ppm)

Water, Health: $15 \times 1.2 \times 10^4 = 1.8 \times 10^5$ μg/l

Land, Health: $0.2 \times 1.8 \times 10^5 = 36{,}000$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 110 = 1.1 \times 10^4$ μg/ℓ

Land, Ecology: $0.2 \times 1.1 \times 10^4 = 2.2 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 12/420 = 28.6$ μg/m^3

$EPC_{AH1a} = 2/420 = 0.005$ ppm

$EPC_{WH1} = 15 \times 28.6 = 429$ μg/l

$EPC_{WH2} = 13.8 \times 12 = 165.6$ μg/l

$EPC_{LH} = 0.2 \times 165.6 = 33.1$ μg/g

$EPC_{WE1} = 50 \times 110 = 5{,}500$ μg/ℓ

$EPC_{LE} = 0.2 \times 5{,}500 = 1{,}100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B100
CAMPHOR

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.2E4		28.6 (0.005)		
Water, $\mu g/l$ (ppm Wt)			1.8E5	1.1E4	165.6	5,500	0.5†
Land, $\mu g/g$ (ppm Wt)			3.6E4	2.2E3	33.1	1,100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			29 (0.005)		
Water, $\mu g/l$ (ppm Wt)			166	5,500	
Land, $\mu g/g$ (ppm Wt)			33	1,100	

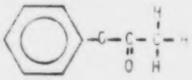
†Finished drinking water.

CATEGORY: 7B

WLN:

ACETOPHENONE: $C_6H_5C_2H_3O_2$ (acetylbenzene, phenyl methyl ketone, 1-phenylethanone). 07B 20
A colorless, slightly flammable liquid.

STRUCTURE:



PROPERTIES:

Molecular wt: 120.16; mp: 20.5; bp: 202.0^{760}; d:1.0281_4^{20}; vap. d: 4.14; vap. press: 1 mm at 15°; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Acetophenone has been reported in samples from finished drinking water 5 times (ref. 2). The highest reported concentration is 1.0 μg/l (ref. 3). It has also been reported in river water (ref. 2).

Acetophenone is used in perfumery to impart an orange blossom-like odor (ref. 9). It is also used as an anesthetic and analgesic agent in medicine (ref. 5).

Acetophenone is formed by oxidation of ethyl benzene (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

Acetophenone has a narcotic effect in high concentrations (ref. 8). It has definite narcotic and analgesic properties when swallowed or injected intravenously or subcutaneously. It can also cause dermatitis in occupationally exposed persons (ref. 5).

In the body, acetophenone is metabolized to a large extent (91.7 percent) to benzoic acid, which appears in the urine as hippuric acid (ref. 5).

Aquatic toxicity: A concentration in water of 0.5 mg/l is reported to cause fish tainting (ref. 5). LC_{50} - 96-hour: 155 mg/ℓ (ref. 17).

LD_{50} (oral, rat): 900 mg/kg (ref. 10).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 900 = 4.05 \times 10^4$ μg/m³

Water, Health: $15 \times 4.05 \times 10^4 = 6.08 \times 10^5$ μg/l

Land, Health: $0.2 \times 6.08 \times 10^5$ μg/l $= 1.2 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 155 = 1.55 \times 10^4$ μg/ℓ

Land, Ecology: $0.2 \times 1.55 \times 10^4 = 3.1 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 900 = 96.3$ μg/m³

$EPC_{AH3} = 0.081 \times 900 = 72.9$ μg/m³

$EPC_{WH1} = 15 \times 72.9 = 1{,}094$ μg/l

$EPC_{WH2} = 0.4 \times 900 = 360$ μg/l

$EPC_{LH} = 0.2 \times 360 = 72$ μg/g

$EPC_{WE1} = 50 \times 155 = 7.750$ μg/ℓ

$EPC_{WE2} = 500$ μg/l (to prevent tainting)

$EPC_{LE} = 0.2 \times 500 = 100$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B120 ACETOPHENONE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background
Air, μg/m^3 (ppm Vol)			4.05E4		73		
Water, μg/l (ppm Wt)			6.08E5	1.55E4	360	500	1†
Land, μg/g (ppm Wt)			1.2E5	3.1E3	72	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			73		
Water, μg/l (ppm Wt)			360	500	
Land, μg/g (ppm Wt)			72	100	

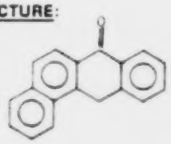
†Finished drinking water.

CATEGORY: 7B

5,6-BENZO-9-ANTHRONE: $C_{17}H_{12}O$ (1,2-benz-10-anthrone, benz(a)
anthrone-7(12H)one). 073160
Pale yellow crystals.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 232; mp: 180-1.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

5,6-Benzo-9-anthrone has been found in coke-oven emissions (ref. 13). It was identified in atmospheric particulate samples taken from Toronto, Ontario in 14 concentrations of 30 to 40 μg/g of particulate (ref. 14).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for 5,6-benzo-9-anthrone are not available at this time.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

07B160
5,6-BENZO-9-ANTHRONE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 7B

CARVONES: 07B180

CARVONE (*d* or ℓ): $C_{10}H_{14}O$ (p-mentha-6,8-dien-2-one, carvol, 2-methyl-5-(1-methylethenyl)-2-cyclohexene-1-one). A liquid. 07B181

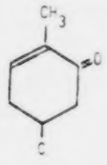
DIHYDRO-(*d* or ℓ)CARVONE: $C_{10}H_{16}O$. A liquid. 07B182

PROPERTIES:

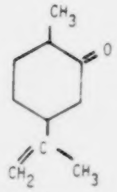
	Mol. wt.	b.p.	d.	solubility in water
Carvone (*d*)	150.22	231^{760}	0.9608_4^{20}	slightly
Carvone (ℓ)	150.22	231^{760}	0.9539_4^{20}	slightly
Dihydrocarvone (*d*)	152.24	221-2	0.928^{19}	...
Dihydrocarvone (ℓ)	152.24	221-2	0.9253_4^{20}	insoluble

WLN: L6V BUTJ B EYU1

STRUCTURE:



Carvone



Dihydro-
(*d* or ℓ)carvone

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS.

d-Carvone occurs in caraway seed, dill seed oils, and mandarin peel oils. ℓ-Carvone is found in spearmint and kuromoji oils. *d*-and ℓ-Carvone occurs in gingergrass oils (ref. 9). Carvone is used as a synthetic flavoring agent (ref. 8).

Dihydro-carvone has been identified in samples of finished drinking water (ref. 2). The highest concentration reported is 0.14 μg/ℓ.

TOXIC PROPERTIES, HEALTH EFFECTS:

Carvones are not highly toxic. Dihydro carvone is reported to possess moderate hemolytic activity compared with borneol (more active), and thymol (less active)(ref. 15).

LD_{50} (oral,rat): 1640 mg/kg (ref. 4).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 1640 = 7.4 \times 10^4$ μg/m³	Air, Ecology:	
Water, Health:	$15 \times 7.4 \times 10^4 = 1.1 \times 10^6$ μg/ℓ	Water, Ecology:	
Land, Health:	$0.2 \times 1.1 \times 10^6 = 2.2 \times 10^5$ μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1640 = 175$ μg/m³

$EPC_{AH3} = 0.081 \times 1640 = 133$ μg/m³

$EPC_{WH1} = 15 \times 133 = 1{,}933$ μg/ℓ

$EPC_{WH2} = 0.4 \times 1640 = 656$ μg/ℓ

$EPC_{LH} = 0.2 \times 656 = 131$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07B180
CARVONES

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
Category	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.4E4		133		
Water, $\mu g/l$ (ppm Wt)			1.1E6		656		0.14†
Land, $\mu g/g$ (ppm Wt)			2.2E5		131		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			133		
Water, $\mu g/l$ (ppm Wt)			656		
Land, $\mu g/g$ (ppm Wt)			131		

†Finished drinking water.

REFERENCES: CATEGORY 7B

Aldehydes, Ketones - Ketones

1. Wagoner, D. Compilation of Ambient Trace Substances. Draft of Report Prepared by Research Triangle Institute Under Contract No. 68-02-1325 for U.S. Environmental Protection Agency. Available from W. G. Tucker, Project Officer, IERL-EPA, Research Triangle Park, N.C. (1976).

2. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

3. U.S. Environmental Protection Agency, Office of Toxic Substances. Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress. Environmental Protection Agency, Washington, DC (1975).

4. National Academy of Sciences, National Research Council. Vapor-Phase Organic Pollutants: Medical and Biological Effects of Environmental Pollutants. National Academy of Science, Washington, DC (1976).

5. Rowe, V. K., and M. A. Wolf. Ketones. Industrial Hygiene and Toxicology, Second Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

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7. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

8. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

9. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

10. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

11. Bond, R. G., C. P. Straub, and R. Prober, Eds. Handbook of Environmental Control. Vol. 1: Air Pollution. The Chemical Rubber Co., Cleveland, OH (1972).

12. Chemical Industry Institute of Toxicology. Second Priority List. Chemical Industry Institute of Toxicology: Annual Report. Research Triangle Park, NC (1976).

REFERENCES: CATEGORY 7B (Continued)

13. Smith, W. M. Evaluation of Coke-oven Emissions. Journal of Occupational Medicine 13(2): 69-74 (1971).

14. Kingsbury, G. L., R. C. Sims, and J. B. White. Source and Ambient Concentration Data for Polycyclic Organic Matter. Vol. I-III. Draft of Report Prepared by Research Triangle Institute, under Contract No. 68-02-2612 for U.S. Environmental Protection Agency. Available from J. O. Milliken, Project Officer, IERL-EPA, Research Triangle Park, N.C. (1978).

15. Rhode, H. Solubility and Hemolytic Activity of Dihyrdocarvone. Biochemiche Zeitschrift 130: 481-496. 1922.

16. Zakhari, S., M. Leibowitz, P. Levy, and D. M. Aviado. Isopropanol and Ketones in the Environment. CRC Press, Cleveland, OH (1977).

17. Mattson, V. R., J. W. Arthur, and C. G. Walbridge. Acute Toxicity of Selected Compounds to Fathead Minnows. U.S. Environmental Protection Agency, Office of Research and Development, Duluth, MN. EPA-600/3-76-097 (1976).

18. National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Ketones. National Institute for Occupational Safety and Health. U.S. Department of Health, Education, and Welfare, DHEW (NIOSH) Publication No. 78-173 (1978).

CATEGORY 7

ALDEHYDES, KETONES

SUBCATEGORY: 7C - Aldehydes and Ketones with Additional Functional Groups

Summary of Subcategory

Total number of compounds in subcategory	15
number of parent compounds with subspecies	1
number of subspecies	14
Number of parent compounds with no MEG values	14
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

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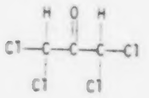
CATEGORY: 7C
TETRACHLOROACETONE: $C_3H_2Cl_4O$
(1,1,3,3-tetrachloro-2-propanone). 07C020
A colorless liquid with a strong, sharp odor.

WLN:

STRUCTURE:



$$\begin{array}{c} H \;\; O \;\; H \\ Cl-C-C-C-Cl \\ Cl \;\;\;\;\; Cl \end{array}$$

PROPERTIES:

Molecular wt: 195.86; mp: 48-49; bp: $180-2^{718}$; very soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Tetrachloroacetone has been reported in samples taken from finished drinking water (ref. 1). The highest reported concentration is 1 µg/l (ref. 2). The compound probably does not occur naturally. It may be formed in drinking water chlorination.

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for tetrachloroacetone are not available at this time. It is probably more toxic than acetone and is likely to be irritating to the eyes and mucous membranes. Toxicity is expected to be intermediate between that of chloroacetone and hexachloracetone. Based on information for structurally similar compounds, it is reasonable to expect the LD_{50} for tetrachloroacetone to be >500 mg/kg (see data below).

Compound	LD_{50} (oral, rat)(ref. 3)
Acetone	8,453
Chloroacetone	50
Hexachloroacetone	1,290
Acetic acid	3,310
Chloroacetic acid	76
Dichloroacetic acid	2,820
Trichloroacetic acid	3,320

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 500 = 2.3 \times 10^4$ µg/m^3

Water, Health: $15 \times 2.3 \times 10^4 = 3.4 \times 10^5$ µg/ℓ

Land, Health: $0.2 \times 3.4 \times 10^5 = 6.8 \times 10^4$ µg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 500 = 54$ µg/m^3

$EPC_{AH3} = 0.081 \times 500 = 41$ µg/m^3

$EPC_{WH1} = 15 \times 41 = 615$ µg/ℓ

$EPC_{WH2} = 0.4 \times 500 = 200$ µg/ℓ

$EPC_{LH} = 0.2 \times 200 = 40$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

07C020
TETRACHLOROACETONE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.3E4		41		
Water, μg/l (ppm Wt)			3.4E5		200		1†
Land, μg/g (ppm Wt)			6.8E4		40		

*To be multiplied by dilution factor

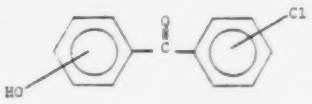
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			41		
Water, μg/l (ppm Wt)			200		
Land, μg/g (ppm Wt)			40		

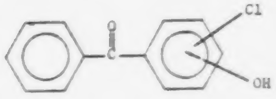
†Finished drinking water.

CATEGORY: 7C

WLN:

STRUCTURE:





CHLOROHYDROXY BENZOPHENONES: $C_{13}H_9O_2Cl$.

Mol. wt. 232.68 07C040

Most isomers are yellow crystals and are insoluble in water.

2-CHLORO-2'-HYDROXY BENZOPHENONE:	07C041
2-CHLORO-3'-HYDROXY BENZOPHENONE:	07C042
2-CHLORO-4'-HYDROXY BENZOPHENONE:	07C043
2-CHLORO-5-HYDROXY BENZOPHENONE:	07C044
3-CHLORO-2'-HYDROXY BENZOPHENONE:	07C045
3-CHLORO-2-HYDROXY BENZOPHENONE:	07C046
3-CHLORO-3'-HYDROXY BENZOPHENONE:	07C047
3-CHLORO-4'-HYDROXY BENZOPHENONE:	07C048
3-CHLORO-4-HYDROXY BENZOPHENONE:	07C049
4-CHLORO-2-HYDROXY BENZOPHENONE:	07C04A
4-CHLORO-2'-HYDROXY BENZOPHENONE:	07C04B
4-CHLORO-3'-HYDROXY BENZOPHENONE:	07C04C.
4-CHLORO-4'-HYDROXY BENZOPHENONE:	07C04D
5-CHLORO-2-HYDROXY BENZOPHENONE:	07C04E

PROPERTIES:

	m.p.	b.p.
2-Chloro-2'-hydroxy benzophenone:	92	
2-Chloro-4'-hydroxy benzophenone:	128	
2-Chloro-5-hydroxy benzophenone:	98-99	
3-Chloro-2'-hydroxy benzophenone:	89	
3-Chloro-2-hydroxy benzophenone:	92.5-93	
3-Chloro-4'-hydroxy benzophenone:	161	
3-Chloro-4-hydroxy benzophenone:	180-181	
4-Chloro-2'-hydroxy benzophenone:	112	
4-Chloro-3'-hydroxy benzophenone:	154-5	
4-Chloro-4'-hydroxy benzophenone:	179.25	257^{13}
5-Chloro-2-hydroxy benzophenone:	95-95.5	

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Chlorohydroxy benzophenones probably do not occur naturally. The 2,2' isomer is used as an insecticide. Chlorohydroxy benzophenones have been identified in finished drinking water and in river water (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for chlorohydroxy benzophenones are not available at this time. The compounds are likely to exhibit properties characteristic of chlorinated phenols as well as those of ketones. Irritant and lachrymator properties are probable. Lethal dose information for related compounds are given below.

3-chloro-4-hydroxybiphenyl: LD_{50} (oral, rat): 4220 mg/kg (ref. 3).
4,4-dichlorobenzophenone: LD_{50} (intraperitoneal, mouse): 200 mg/kg (ref. 3).
2,4-dihydroxybenzophenone: LD_{50} (intravenous, mouse) 85 mg/kg (ref. 3).
3,5-dihydroxybenzophenone: LD_{50} (intravenous, mouse): 75 mg/kg (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

07C040

CHLOROHYDROXY BENZOPHENONES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)							
Water, μg/l (ppm Wt)							
Land, μg/g (ppm Wt)							

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)					
Water, μg/l (ppm Wt)					
Land, μg/g (ppm Wt)					

REFERENCES: CATEGORY 7C

Aldehydes and Ketones with Additional Functional Groups

1. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

2. U.S. Environmental Protection Agency, Office of Toxic Substances. Preliminary Assessment of Suspected Carcinogens in Drinking Water: Report to Congress. Environmental Protection Agency, Washington, DC (1975).

3. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

CATEGORY 8

CARBOXYLIC ACIDS AND DERIVATIVES

SUBCATEGORY: 8A - Carboxylic Acids

Summary of Subcategory

Total number of compounds in subcategory	15
number of parent compounds with subspecies	2
number of subspecies	7
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

CATEGORY: 8A

WLN: VHQ

FORMIC ACID: CH_2O_2 (methanoic acid). 08A020

A colorless, fuming liquid; pungent odor.

STRUCTURE:

PROPERTIES:

Molecular wt: 46.03; mp: 8.4; bp: 100.7; d: 1.220;
vap. d: 1.59; vap. press.: 43 mm at 25°; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formic acid is the first in the aliphatic series of carboxylic acids. It is a strong reducing agent and is more highly dissociated in water than is acetic acid.

TOXIC PROPERTIES, HEALTH EFFECTS:

Formic acid acts as an irritant to mucous membranes, eyes, and skin. Workers exposed to 15 ppm complained of nausea (ref. 1). Chronic absorption may cause albuminuria and hematuria (ref. 2).

LD_{50} (oral, rat): 1,210 mg/kg.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 9 mg/m^3 (5 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 9×10^3 $\mu g/m^3$ (5 ppm)	Air, Ecology:
Water, Health: $15 \times 9 \times 10^3 = 1.4 \times 10^5$ $\mu g/\ell$	Water, Ecology:
Land, Health: $0.2 \times 1.4 \times 10^5 = 2.8 \times 10^4$ $\mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 9/420 = 21$ $\mu g/m^3$
$EPC_{AH1a} = 5/420 = 0.01$ ppm
$EPC_{WH1} = 15 \times 21 = 315$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 9 = 124$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 124 = 25$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X
08A020
FORMIC ACID

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			9.0E3 (5)		21 (0.01)		
Water, $\mu g/l$ (ppm Wt)			1.4E5		124		
Land, $\mu g/g$ (ppm Wt)			2.8E4		25		

*To be multiplied by dilution factor

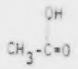
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			21 (0.01)		
Water, $\mu g/l$ (ppm Wt)			124		
Land, $\mu g/g$ (ppm Wt)			25		

CATEGORY: 8A

WLN: QV1

ACETIC ACID: $C_2H_4O_2$ (ethanoic acid). 08A040
A clear, colorless liquid; pungent odor.

STRUCTURE:



$CH_3-\overset{\overset{OH}{|}}{C}=O$

PROPERTIES:

Molecular wt: 60.05; mp: 16.6; bp: 118.1;
d: 1.049; vap. press.: 11.4 mm at 20°; vap. d: 2.07;
miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Organic acids are emitted to the atmosphere in large quantities from coal-fired boilers. An average of 12.4 lb of organic acid (as acetic acid) per ton of coal burned is reported for one large plant (ref. 3).

Acetic acid is formed by the air oxidation of acetaldehyde. Bacterial oxidation of ethyl alcohol also results in formation of acetic acid.

The concentration of acetic acid in rural atmosphere is reported as 1.0 ppm (ref. 4). This is equivalent to 2.45 mg/m^3. (This value is representative of an agricultural area and is not indicative of a natural background concentration.) The odor recognition level is reported as 2.7 mg/m^3 (ref. 5).

High concentrations of organic acids in water cause a lowering of the pH.

TOXIC PROPERTIES, HEALTH EFFECTS:

Vapors of acetic acid may cause irritation of mucous membranes, lacrimation, conjunctivitis, and dermatitis (ref. 6). Irritative effects are produced in humans by 816 ppm for 3 minutes (ref. 7). Conjunctival irritation has occurred at 10 ppm (ref. 1).

LD_{50} (oral, rat): 3,310 mg/kg.
LC_{50} (inhalation, mouse): 5,620 ppm for 1 hour.
Aquatic toxicity: TLm 96: 100-10 ppm (ref. 7).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 25 mg/m^3 (10 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 2.5×10^4 µg/m^3 (10 ppm)
Water, Health: $15 \times 2.5 \times 10^4 = 3.8 \times 10^5$ µg/ℓ
Land, Health: $0.2 \times 3.3 \times 10^5 = 7.6 \times 10^4$ µg/g

Air, Ecology:
Water, Ecology: $100 \times 10 = 1.0 \times 10^3$ µg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^3 = 200$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 25/420 = 60$ µg/m^3
$EPC_{AH1a} = 10/420 = 0.02$ ppm
$EPC_{WH1} = 15 \times 60 = 900$ µg/ℓ
$EPC_{WH2} = 13.8 \times 25 = 345$ µg/ℓ
$EPC_{LH} = 0.2 \times 345 = 70$ µg/g

$EPC_{WE1} = 50 \times 10 = 500$ µg/ℓ

$EPC_{LE} = 0.2 \times 500 = 100$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A040
ACETIC ACID

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			2.5E4 (10)		60 (0.02)		
Water, μg/l (ppm Wt)			3.8E5	1.0E3	345	500	
Land, μg/g (ppm Wt)			7.6E4	2.0E2	70	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			60 (0.02)		
Water, μg/l (ppm Wt)			345	500	
Land, μg/g (ppm Wt)			70	100	

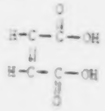
CATEGORY: 8A

MALEIC ACID: $C_4H_4O_4$ (cis-butenedioic acid, toxilic acid, 1,2-ethylenedicarboxylic acid, maleinic acid, cis-1,2-ethylene-dicarboxylic acid, malenic acid) 08A060

A white crystal from water, it has a faint acidulous odor, and a characteristic repulsive, astringent taste.

WLN: QV1U1VQ-C

STRUCTURE:



PROPERTIES:

Molecular wt: 116.07; mp: 130.5; bp: 135 (decomposes); d: 1.590^{20}_{4}; vap.d: 4.0; soluble in water

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Maleic acid is a byproduct of phthalic acid manufacture; it can also be formed by the oxidation of benzene (ref. 8).

Maleic acid is used in the production of resins, dyes, and in preparing the maleate salts of antihistamines and similar drugs (ref. 2).

Maleic acid is converted, in part, into the much higher melting fumaric acid when heated to a temperature above the melting point (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Maleic acid is a strong acid and can produce marked irritation of skin and mucous membranes (ref. 8). There are no reports of cumulative toxic effects in man (ref. 8).

LD_{50} (oral, rat): 708 mg/kg (ref. 7).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1 mg/m^3 (0.25 ppm) for maleic anhydride.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 708 = 3.19 \times 10^4$ µg/m^3

Water, Health: $15 \times 3.19 \times 10^4 = 4.79 \times 10^5$ µg/l

Land, Health: $0.2 \times 4.79 \times 10^5 = 9.6 \times 10^4$ µg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 708 = 75.8$ µg/m^3

$EPC_{AH3} = 0.081 \times 708 = 57.3$ µg/m^3

$EPC_{WH1} = 15 \times 57.3 = 859.5$ µg/l

$EPC_{WH2} = 0.4 \times 708 = 283.2$ µg/l

$EPC_{LH} = 0.2 \times 283.2 = 57$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A060
MALEIC ACID

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.19E4 (0.25)		57		
Water, μg/l (ppm Wt)			4.79E5		283		
Land, μg/g (ppm Wt)			9.6E4		57		

*To be multiplied by dilution factor

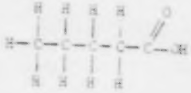
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			57		
Water, μg/l (ppm Wt)			283		
Land, μg/g (ppm Wt)			57		

CATEGORY: 8A

VALERIC ACID: $C_5H_{10}O_2$. (pentanoic acid, propylacetic acid, valerianic acid, butanecarboxylic acid) 08A080
A colorless liquid with an unpleasant odor.

WLN: QV4

STRUCTURE:



PROPERTIES:

Molecular wt: 102.13; mp: -33.83; bp: 186.05^{760};
d: 0.9391_4^{20}; vap.press: 1 mm Hg at 42°; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Valeric acid is normally found in valerian. It is formed by the oxidation of amyl alcohol, and is used in perfumes, flavors, and medicine (ref. 8).

Valeric acid has been reported to be present in groundwater, river water, and well water (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Valeric acid is a strong skin irritant in undiluted form. It is metabolized by splitting into acetic acid and pyruvic acid. No cumulative effects are reported (ref. 8).

LD_{50} (oral, mouse): 500 mg/kg (ref. 7).

Aquatic toxicity: 96-hour LC_{50} = 77 mg/ℓ (ref. 12).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 500 = 2.25 \times 10^4$ μg/m³

Water, Health: $15 \times 2.25 \times 10^4 = 3.38 \times 10^5$ μg/l

Land, Health: $0.2 \times 3.38 \times 10^5 = 6.8 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 77 = 7.7 \times 10^3$ μg/ℓ

Land, Ecology: $0.2 \times 7.7 \times 10^3 = 1.5 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 500 = 53.5$ μg/m³

$EPC_{AH3} = 0.081 \times 500 = 40.5$ μg/m³

$EPC_{WH1} = 15 \times 40.5 = 607.5$ μg/l

$EPC_{WH2} = 0.4 \times 500 = 200$ μg/l

$EPC_{LH} = 0.2 \times 200 = 40$ μg/g

$EPC_{WE1} = 50 \times 77 = 3,850$ μg/ℓ

$EPC_{LE} = 0.2 \times 3,850 = 77$ μg/g

08A080
VALERIC ACID

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			2.25E4		40.5		
Water, μg/l (ppm Wt)			3.38E5	7.7E3	200	3,850	
Land, μg/g (ppm Wt)			6.8E4	1.5E3	40	77	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			40.5		
Water, μg/l (ppm Wt)			200	3,850	
Land, μg/g (ppm Wt)			40	77	

CATEGORY: 8A

WLN:

SATURATED LONG CHAIN ACIDS (MW 116-201) 08A100

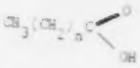
CAPROIC ACID: $C_6H_{12}O_2$ (hexanoic acid). 08A101
Colorless liquid with goat-like odor.

CAPRYLIC ACID: $C_8H_{16}O_2$ (octanoic acid). 08A102
Colorless liquid with rancid taste.

CAPRIC ACID: $C_{10}H_{20}O_2$ (n-decanoic acid, n-decoic acid). 08A103
Colorless crystals, rancid odor.

LAURIC ACID: $C_{12}H_{24}O_2$ (dodecanoic acid) 08A104
White powder, slight odor.

STRUCTURE:



PROPERTIES:

	mol. wt.	mp.	bp	d.	vap. d.	vap. press.	solubility in water (g/100 g)
Caproic acid	116.2	-3.0	205	0.9274^{20}_{4}	4.0	0.18 mm at 20°	1.0
Caprylic acid	114.2	16.5	239	0.9008^{20}_{4}		1 mm at 92°	0.7
Capric acid	172.26	31.4	269	0.885^{40}_{4}			0.2
Lauric acid	200.31	48	225^{100}	0.8679^{50}_{4}		1 mm at 121°	insoluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Acid	Occurrence in Water		Source	Uses	Formation
	Fresh	Ground			
Caproic					
Caprylic	Once (ref. 11)	Once (ref. 11)	Milk fats (ref. 2) Coconut oil (ref. 2)	Artificial flavor (ref. 2) Drugs (ref. 8) Perfumery, dyes (ref. 2)	From oleic acid (ref. 2) From coconut oil (ref. 8) Oxidation of octanol (ref. 2) From octyl bromide (ref. 2)
Capric				food additive (ref. 6) Manufacture of esters for artificial flavors, perfumes (ref. 2)	
Lauric	Twice (ref. 11)		Coconut oil (ref. 2)	Chemical synthesis, glycerides used in food (ref. 8)	Distillation of coconut oil acids (ref. 8)

TOXIC PROPERTIES, HEALTH EFFECTS:

Acid	LD_{50}(oral, rat) mg/kg	LD_{50}(intravenous, mouse) mg/kg (ref. 7)	Effects (acute/chronic)	Metabolic fate
Caproic	3,000 (ref. 7)	3180(intraperitoneal)	Irritation of eye and skin (ref. 8)	
Caprylic		600	Irritation causing coughing (ref. 6)	Normal pathway for similar fatty acids (ref. 8)
Capric		129		
Lauric		131	Low toxicity (ref. 6)	Incorporated into fat (ref. 8)

Aquatic toxicity: 96-hour LC_{50} = 88 mg/ℓ for caproic acid (ref. 12).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 129 = 5.8 \times 10^3$ µg/m³

Water, Health: $15 \times 5.8 \times 10^3 = 8.7 \times 10^4$ µg/l

Land, Health: $0.2 \times 8.7 \times 10^4 = 1.7 \times 10^4$ µg/g

Air, Ecology:

Water, Ecology: $100 \times 88 = 8.8 \times 10^3$ µg/ℓ

Land, Ecology: $0.2 \times 8.8 \times 10^3 = 1.8 \times 10^3$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 129 = 13.8$ µg/m³

$EPC_{AH3} = 0.081 \times 129 = 10.4$ µg/m³

$EPC_{WH1} = 15 \times 10.4 = 156$ µg/l

$EPC_{WH2} = 0.4 \times 129 = 51$ µg/ℓ

$EPC_{LH} = 0.2 \times 51 = 10$ µg/g

$EPC_{WE1} = 50 \times 88 = 4,400$ µg/ℓ

$EPC_{LE} = 0.2 \times 4,400 = 880$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A100
SATURATED LONG CHAIN ACIDS (MW: 116-201)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			5.8E3		10.4		
Water, μg/l (ppm Wt)			8.7E4	8.8E3	51	4,400	
Land, μg/g (ppm Wt)			1.7E4	1.8E3	10	880	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			10.4		
Water, μg/l (ppm Wt)			51	4,400	
Land, μg/g (ppm Wt)			10	880	

CATEGORY: 8A

SATURATED LONG CHAIN ACIDS (MW: 228-285). 08A120

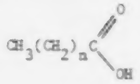
MYRISTIC ACID: $C_{14}H_{28}O_2$ (n-tetradecoic acid, 1-tridecane carboxylic acid, tetradecanoic acid). 08A121
A white solid.

PALMITIC ACID: $C_{15}H_{32}O_2$ (cetylic acid, hexadecanoic acid, hexadecyclic acid). 08A122
White crystals.

STEARIC ACID: $C_{18}H_{36}O_2$ (octadecanoic acid). 08A123
White crystals, slight taste, tallow odor.

WLN:

STRUCTURE:



PROPERTIES:

	mol. wt.	mp.	bp.	d.	vap. press.	solubility in water
Myristic acid	228.36	54	257^{100}	0.8439^{80}_{4}		insoluble
Palmitic acid	256.42	63	269^{100}	0.8527^{62}_{4}		insoluble
Stearic acid	284.47	70	287^{100}	0.9408^{20}_{4}	1 mm at 173.7°	slightly

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

	Occurrence in Water		Source (ref. 2).	Uses	Formation (ref. 2).
	Fresh	Drinking			
Myristic	Four times (ref. 11)		Nutmeg butter, animal and vegetable fat	Soaps, cosmetics, flavors, perfumes (ref. 8)	From tall-oil fatty acids
Palmitic	Twice (ref. 11)	Once (ref. 11)	As glyceral ester in oils and fats	Manufacture of soaps and oils (ref. 8)	
Stearic			As glyceride in animal fats and oils	For suppositories and cosmetics (ref. 2).	Hydrogenation of vegetable oils

TOXIC PROPERTIES, HEALTH EFFECTS:

Myristic, palmitic, and stearic are reported to be of low toxicity (ref. 8).

	LD_{50}(intravenous, mouse) (ref. 7) mg/kg *
Myristic	43
Palmitic	57
Stearic	23

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 23 = 1,035\ \mu g/m^3$	Air, Ecology:
Water, Health: $15 \times 1,035 = 1.55 \times 10^4\ \mu g/l$	Water, Ecology:
Land, Health: $0.2 \times 1.55 \times 10^4 = 3.1 \times 10^3\ \mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 129 = 14\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 129 = 10.4\ \mu g/m^3$

$EPC_{WH1} = 15 \times 10.4 = 157\ \mu g/l$

$EPC_{WH2} = 0.4 \times 129 = 52\ \mu g/l$

$EPC_{LH} = 0.2 \times 52 = 10\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

08A120

SATURATED LONG CHAIN ACIDS (MW: 228-285)

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.04E3		10.4		
Water, $\mu g/l$ (ppm Wt)			1.55E4		52		
Land, $\mu g/g$ (ppm Wt)			3.1E3		10		

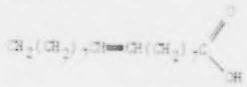
*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			10.4		
Water, $\mu g/l$ (ppm Wt)			52		
Land, $\mu g/g$ (ppm Wt)			10		

CATEGORY: 9A
OLEIC ACID: $C_{18}H_{34}O_2$
(cis-9-octadecanoic acid): 08A140
Colorless crystals.

WLN:

STRUCTURE:


$CH_3(CH_2)_7CH{=}CH(CH_2)_7C(=O)OH$

PROPERTIES:

Molecular wt: 282.45; mp: 16; bp: 223; d: 0.8935^{20}_{4}; vap. press: 1 mm at 176.5; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Oleic acid has been identified twice in fresh water (ref. 9). It is obtained from animal fats and vegetable oils (ref. 2). It is used for rodent extermination and in polishing compounds (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral,rat): 74 mg/kg (ref. 7).

Oleic acid is reported to cause tumors in rabbits (ref. 7). The EPA/NIOSH ordering number is 2101. Lowest dosage to induce a tumorigenic response is 3,120 mg/kg. The adjusted ordering number is 0.67.

Aquatic toxicity: 96-hour LC_{50} = 205 mg/l (ref 12).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 74 = 3.3 \times 10^3$ μg/m³

Water, Health: $15 \times 3.3 \times 10^3 = 5.0 \times 10^4$ μg/l

Land, Health: $0.2 \times 5.0 \times 10^4 = 1.0 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 205 = 2.05 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 2.05 \times 10^4 = 4.1 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 74 = 8$ μg/m³

$EPC_{AH3} = 0.081 \times 74 = 6$ μg/m³

$EPC_{WH1} = 15 \times 6 = 90$ μg/l

$EPC_{WH2} = 0.4 \times 74 = 30$ μg/l

$EPC_{LH} = 0.2 \times 30 = 6$ μg/g

$EPC_{WE1} = 50 \times 205 = 10{,}000$ μg/l

$EPC_{LE} = 0.2 \times 10{,}000 = 2{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A140
OLEIC ACID

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.3E3		6		
Water, μg/l (ppm Wt)			5.0E4	2.05E4	30	10,000	
Land, μg/g (ppm Wt)			1.0E4	4.1E3	6	2,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

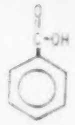
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			6		
Water, μg/l (ppm Wt)			30	10,000	
Land, μg/g (ppm Wt)			6	2,000	

CATEGORY: 8A

WLN: QVR

BENZOIC ACID: C_6H_5COOH (benzenecarboxylic acid, phenyl formic acid). DRA160
White needles or powder.

STRUCTURE:



PROPERTIES:

Molecular wt: 122.13; bp: 249.2; mp: 122.4; begins to sublime at around 100°; volatile with steam; solubility: 0.34 g/100 g; soluble in hot water; vap. press.: 1 mm at 96°; vap. d: 4.21.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS.

Benzoic acid may be formed by the air oxidation (in presence of catalyst) of toluene.

It occurs in nature in both free and combined states. Most berries contain benzoic acid--0.05 percent (ref. 2).

In water, benzoic acid is more highly dissociated than acetic acid but less than formic acid.

It is used in preserving foods and in curing tobacco (ref. 2). Concentrations of 15 μg/ℓ have been found in samples of public drinking water supplies (ref. 10)

TOXIC PROPERTIES, HEALTH EFFECTS:

Benzoic acid is an irritant to eyes, skin, and mucous membranes (ref. 2). 6 mg/kg applied to human skin has resulted in a toxic response (ref. 7). Severe toxic effects have not been reported.

LD_{50}(oral, rat): 3,040 mg/kg. (ref. 7)

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 3{,}040 = 1.4 \times 10^5$ μg/m^3
Water, Health: $15 \times 1.4 \times 10^5 = 2.1 \times 10^6$ μg/ℓ
Land, Health: $0.2 \times 2.1 \times 10^6 = 4.2 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 3{,}040 = 325$ μg/m^3
$EPC_{AH3} = 0.081 \times 3{,}040 = 246$ μg/m^3
$EPC_{WH1} = 15 \times 246 = 3{,}700$ μg/ℓ
$EPC_{WH2} = 0.4 \times 3{,}040 = 1{,}220$ μg/ℓ
$EPC_{LH} = 0.2 \times 1{,}220 = 244$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A160
BENZOIC ACID

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.4E5		246		
Water, $\mu g/l$ (ppm Wt)			2.1E6		1,220		15†
Land, $\mu g/g$ (ppm Wt)			4.2E5		244		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			246		
Water, $\mu g/l$ (ppm Wt)			1,220		
Land, $\mu g/g$ (ppm Wt)			244		

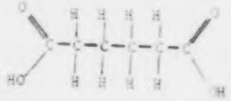
†Public drinking water.

CATEGORY: 8A

ADIPIC ACID: $C_6H_{10}O_4$ (1,4-butanedicarboxylic acid, hexane dioic acid). U8A180
Fine white crystals or powder.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 146.14; mp: 152; bp: 337.5; d: 1.360^{25}_{4}; vap. press: 1 mm at 159.5°; vap.d: 5.04; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Adipic acid is used in the manufacture of nylon (ref. 8). It is also a general purpose food additive (refs. 6,2). The compound has been reported in beet juice (ref. 2), and in effluents from a nylon manufacturing plant (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

Animal studies with adipic acid generally indicate low toxicity for the compound. Adipic acid is slowly excreted in the urine and is believed to be partly oxidized (ref. 8).

LD_{Lo} (oral,rat): 3,600 mg/kg (ref. 7).

Aquatic toxicity: 96-hour LC_{50} = 97 mg/l (ref. 12).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 3{,}600 = 1.62 \times 10^5$ μg/m³

Water, Health: $15 \times 1.62 \times 10^5 = 2.43 \times 10^6$ μg/l

Land, Health: $0.2 \times 2.43 \times 10^6 = 4.86 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 97 = 9.7 \times 10^3$ μg/l

Land, Ecology: $0.2 \times 9.7 \times 10^3 = 1.9 \times 10^3$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 3{,}600 = 385.2$ μg/m³

$EPC_{AH3} = 0.081 \times 3{,}600 = 291.6$ μg/m³

$EPC_{WH1} = 15 \times 291.6 = 4{,}374$ μg/l

$EPC_{WH2} = 0.4 \times 3{,}600 = 1{,}440$ μg/l

$EPC_{LH} = 0.2 \times 1{,}440 = 288$ μg/g

$EPC_{WE1} = 50 \times 97 = 4{,}850$ μg/l

$EPC_{LE} = 0.2 \times 4{,}850 = 970$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A180
ADIPIC ACID

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.62E5		292		
Water, $\mu g/l$ (ppm Wt)			2.43E6	9.7E3	1,440	4,850	
Land, $\mu g/g$ (ppm Wt)			4.86E5	1.9E3	288	970	

*To be multiplied by dilution factor

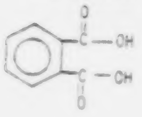
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. *Zero Threshold Pollutants* Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			292		
Water, $\mu g/l$ (ppm Wt)			1,440	4,850	
Land, $\mu g/g$ (ppm Wt)			288	970	

CATEGORY: 8A

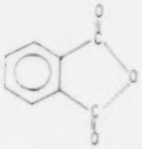
WLN: QVR BVQ

PHTHALIC ACID: $C_8H_6O_4$ (1,2-benzenedicarboxylic acid, o-phthalic acid). 08A200
Colorless crystals.

STRUCTURE:



Phthalic acid



Phthalic anhydride

PROPERTIES:

Molecular wt: 166.14; mp: 210-211 (decomposes, sublimes); d: 1.593; solubility: 0.7 g/100 g; very soluble in hot water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Phthalic acid is an aromatic dicarboxylic acid. Both carboxylic acid functions may react to form salts, esters, amide, or anhydride. The anhydride reacts with water, reforming the phthalic acid. In water, one carboxylic acid function is ionized to a greater extent than is acetic acid, formic acid, or benzoic acid; ionization of the second carboxylic acid function occurs less readily.

Phthalic acid may be formed by the hydrolysis of benzene-1,2-dinitrile or by oxidation of 1,2-dimethyl benzene.

TOXIC PROPERTIES, HEALTH EFFECTS:

Phthalic acid acts as an irritant to skin, eye, and upper respiratory system.

LD_{Lo} (oral, rat): 4,600 mg/kg. (ref. 7)

Teratogenic effects due to phthalic acid are reported. A 4 percent incidence of congenital defects resulted in chicks receiving 3 to 20 mg via the yolk sac or air cell before incubation (ref. 11). The EPA/NIOSH ordering number based on this data is 1101. It is not possible to extrapolate to mg/kg the dosage administered directly to the egg yolk sac of a chick, so adjusted ordering number cannot be determined from this data.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV (phthalic anhydride): 6 mg/m^3 (1 ppm).
(Phthalic acid is formed by the reaction of phthalic anhydride and water.)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 4{,}600 = 2.07 \times 10^5$ μg/m^3
Water, Health: $15 \times 2.07 \times 10^5 = 3.1 \times 10^6$ μg/l
Land, Health: $0.2 \times 3.1 \times 10^6 = 6.2 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 4{,}600 = 492$ μg/m^3
$EPC_{AH3} = 0.081 \times 4{,}600 = 373$ μg/m^3
$EPC_{WH1} = 15 \times 373 = 5{,}590$ μg/ℓ
$EPC_{WH2} = 0.4 \times 4{,}600 = 1{,}840$ μg/ℓ
$EPC_{LH} = 0.2 \times 1{,}840 = 368$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08A200
PHTHALIC ACID

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.07E5		373		
Water, μg/l (ppm Wt)			3.1E6		1,840		
Land, μg/g (ppm Wt)			6.2E5		368		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			373		
Water, μg/l (ppm Wt)			1,840		
Land, μg/g (ppm Wt)			368		

REFERENCES - CATEGORY 8A

Carboxylic Acids and Derivatives - Carboxylic Acids

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9. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600-4/76-062, December 1976.

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12. Mattson, V. R., J. W. Arthur, and C. G. Walbridge. Acute Toxicity of Selected Compounds to Fathead Minnows. U.S. Environmental Protection Agency, Office of Research and Development, Duluth, MN. EPA-600/3-76-097 (1976).

CATEGORY 8

CARBOXYLIC ACIDS AND DERIVATIVES

SUBCATEGORY: 8B - Carboxylic Acids with Additional Functional Groups

Summary of Subcategory

Total number of compounds in subcategory	7
number of parent compounds with subspecies	1
number of subspecies	3
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	1

Consent Decree compounds included in subcategory: None

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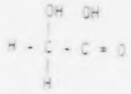
CATEGORY: 8B

WLN: QV1Q

HYDROXYACETIC ACID: $C_2H_4O_3$ (glycolic acid, hydroxyethanoic acid). 08B020

Colorless, odorless, somewhat hygroscopic leaflets.

STRUCTURE:



$$H-\overset{\overset{OH}{|}}{\underset{\underset{H}{|}}{C}}-\overset{OH}{C}=O$$

PROPERTIES:

Molecular wt: 76.05; mp: 80° (decomposes); pka = 3.83 (ref. 1) soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Hydroxyacetic acid is an α-hydroxy acid. In water, it is more highly dissociated than acetic acid. It is found in sugarcane juice (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Hydroxyacetic acid is more toxic than acetic acid. It is primarily an irritant to mucous membranes.

LD_{50} (oral, rat): 1,950 mg/kg (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 25 mg/m^3 (10 ppm) for acetic acid.

* **MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health: 2.5×10^4 $\mu g/m^3$ (10 ppm)

Water, Health: $15 \times 2.5 \times 10^4 = 3.8 \times 10^5$ $\mu g/\ell$

Land, Health: $0.2 \times 3.8 \times 10^5 = 7.6 \times 10^4$ $\mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

* **ESTIMATED PERMISSIBLE CONCENTRATIONS**:

$EPC_{AH1} = 10^3 \times 25/420 = 60\ \mu g/m^3$

$EPC_{AH1a} = 10/420 = 0.02$ ppm

$EPC_{WH1} = 15 \times 60 = 900\ \mu g/\ell$

$EPC_{WH2} = 13.8 \times 25 = 345\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 345 = 70\ \mu g/g$

* Based on TLV for acetic acid.

MULTIMEDIA ENVIRONMENTAL GOALS

08B020
HYDROXYACETIC ACID

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects †	Based on Ecological Effects	Based on Health Effects †	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.5E4		60 (0.02)		
Water, μg/l (ppm Wt)			3.8E5		345		
Land, μg/g (ppm Wt)			7.6E4		70		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated * Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			60 (0.02)		
Water, μg/l (ppm Wt)			345		
Land, μg/g (ppm Wt)			70		

† Based on TLV for acetic acid.

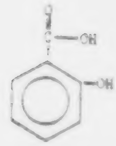
CATEGORY: 88

HYDROXYBENZOIC ACIDS: $C_7H_6O_3$ 088040

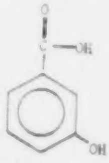
- 2-HYDROXYBENZOIC ACID (o-hydroxybenzoic acid, salicylic acid) 088041
  A white crystal or powder with sweetish, afterward acrid taste.
- 3-HYDROXYBENZOIC ACID. 088042
- 4-HYDROXYBENZOIC ACID. (p-hydroxybenzoic acid). Crystals. 088043

WLN:

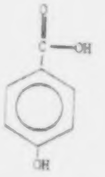
STRUCTURE:



2-HYDROXYBENZOIC ACID



3-HYDROXYBENZOIC ACID



4-HYDROXYBENZOIC ACID

PROPERTIES:

	mol. wt.	mp	bp	d	vap. press.	solubility in water
2-hydroxybenzoic acid	138.12	159	211^{20}	1.44	1mm at 113.7°	slight
3-hydroxybenzoic acid	138.12	201.5				slight
4-hydroxybenzoic acid	138.12	214.5		1.46		slight

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

4-Hydroxybenzoic acid is used in organic syntheses as an intermediate for dyes and fungicides. It is a metabolic product of *Penicillium patulum* (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Because salicylic acid has an ability to penetrate skin and a large dissociation constant (pKa = 3.00), it can cause severe local burns (ref. 1). It may also produce nausea, dizziness, and rapid breathing (ref. 4).

Salicylic acid is excreted as such, and also is conjugated with glycine and excreted as an oxidation product (gentisic acid) (ref. 1).

LD_{50} (oral, rat): 891 mg/kg (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Salicylic acid is permitted as a food additive for human consumption by the FDA (ref. 6).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 891 = 4.0 \times 10^4$ μg/m^3	Air, Ecology:	
Water, Health:	$15 \times 4.0 \times 10^4 = 6.0 \times 10^5$ μg/l	Water, Ecology:	
Land, Health:	$0.2 \times 6.0 \times 10^5 = 1.2 \times 10^5$ μg/g	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 891 = 95.3$ μg/m^3

$EPC_{AH3} = 0.081 \times 891 = 72.2$ μg/m^3

$EPC_{WH1} = 15 \times 72.2 = 1{,}083$ μg/l

$EPC_{WH2} = 0.4 \times 891 = 356.4$ μg/l

$EPC_{LH} = 0.2 \times 356.4 = 71$ μg/g

08B040
HYDROXYBENZOIC ACIDS

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.0E4		72		
Water, $\mu g/l$ (ppm Wt)			6.0E5		356		
Land, $\mu g/g$ (ppm Wt)			1.2E5		71		

*To be multiplied by dilution factor

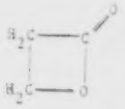
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			72		
Water, $\mu g/l$ (ppm Wt)			356		
Land, $\mu g/g$ (ppm Wt)			71		

CATEGORY: 8B

β-PROPIOLACTONE: $C_3H_4O_2$ (propanoic acid-3-hydroxy lactone, 2-oxetanone, hydracrylic acid-β-lactone, β-propiono lactone, propanolide, betaprone, BPL, 3-Hydroxy propionic acid lactone).
088060
A liquid.

WLN: T4OVTJ

STRUCTURE:



PROPERTIES:

Molecular wt: 72.06; mp: -33.4; bp: 56 to 57^{15}; d: 1.1460_4^{20}; vap. p.: 3.4 mm at 25° C (ref. 5); solubility in water: 37% v/v (ref. 5).

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

β-Propiolactone is a versatile intermediate in organic synthesis (ref. 2) and a viricidal agent in plasma and tissue grafts (ref. 1). It tends to polymerize on storage (ref. 5). It is not reported to occur as such in volume (ref. 5).

It has a high chemical reactivity and readily hydrolyzes in water to β-hydroxypropionic acid. It reacts readily with biological material; unhydrolyzed material is likely to be adsorbed to suspended particulate matter in water. In salt water it probably forms 3-chloropropionic acid (ref. 6). It has a short half-life in water (ref. 5).

β-Propiolactone is not known to occur in nature (ref. 5).

TOXIC PROPERTIES, HEALTH EFFECTS:

β-Propiolactone is considered to be the most toxic of the lactones (ref. 4). While β-propiolactone causes liver and renal tubular damage when administered intravenously by itself, if it is allowed to react with proteins before injection, the toxicity is reported to be much reduced (ref. 1).

LD_{50} (oral, rat): 50 mg/kg (ref. 1).

LC_{50} (inhalation, rat): 250 ppm for 30 minutes (ref. 3).

β-Propiolactone is reported to produce cancer in experimental animals (refs. 5, 3). The EPA/NIOSH ordering number based on carcinogenicity is 4,428. The lowest dose to induce carcinogenic response is 20 mg/kg, and the adjusted ordering number is 221. It is carcinogenic to mice after a single dose exposure (ref. 5).

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

FDA has declared β-propiolactone to be a carcinogen (ref. 2).

β-propiolactone has been the subject of a NIOSH hazard review document (ref. 7).

β-propiolactone is designated by OSHA as a cancer suspect agent; special precautions for exposed workers are prescribed (ref. 8).

β-propiolactone is designated by ACGIH as an industrial substance suspect of carcinogenic potential for man. Because of high acute toxicity and demonstrated skin tumor production in animals, contact by all routes should be avoided (ref. 10).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/221 = 317\ \mu g/m^3$

Water, Health: $15 \times 317 = 4{,}755\ \mu g/l$

Land, Health: $0.2 \times 4{,}755 = 950\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/l$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000\ \mu g/l$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 50 = 5.35\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 50 = 4.05\ \mu g/m^3$

$EPC_{WH1} = 15 \times 4.05 = 60.75\ \mu g/l$

$EPC_{WH2} = 0.4 \times 50 = 20\ \mu g/l$

$EPC_{LH} = 0.2 \times 20 = 4\ \mu g/g$

$EPC_{AC2} = 10^3/(6 \times 221) = 0.75\ \mu g/m^3$

$EPC_{WC} = 15 \times 0.75 = 11.25\ \mu g/l$

$EPC_{LC} = 0.2 \times 11.25 = 2\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5{,}000\ \mu g/l$

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000\ \mu g/g$

08B060
β-PROPIOLACTONE

EMISSION LEVEL GOALS	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.17E2		0.75		
Water, µg/l (ppm Wt)			4.755E3	1.0E4	11.25	5,000	
Land, µg/g (ppm Wt)			9.5E2	2.0E3	4	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			4		0.75
Water, µg/l (ppm Wt)			20	5,000	11.25
Land, µg/g (ppm Wt)			4	1,000	2

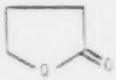
CATEGORY: 3B

γ-BUTYROLACTONE: $C_4H_6O_2$

(4-hydroxy butanoic acid lactone, 4-butyrolactone, dihydro-2(3H)-furanone). 088080

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 86.09; mp: -42; bp: 206^{760}; d: 1.1286^{16}_{0}; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

γ-Butyrolactone is used as a solvent and in petroleum processes and as an intermediate in the production of several chemicals (ref. 1,9). It is reported to occur in beer, wine, coffee, cooked meats, roasted filberts, vinegar, and tomatoes as well as in tobacco smoke condensate and in a liquid wood smoke preparation (ref. 9).

γ-Butyrolactone is metabolized rapidly in rats to γ-hydroxybutyric acid, and the biological half-life of this compound is <6 hours (ref. 9).

TOXIC PROPERTIES, HEALTH EFFECTS:

γ-Butyrolactone probably has a low acute toxicity (ref. 1). Its metabolite, γ-hydroxybutyric acid causes central nervous system depression (ref. 9).

LD_{50} (rats and mice): 800-1600 mg/kg (ref. 1).

γ-Butyrolactone has been tested in mice, by several routes of administration for oncogenic properties. No carcinogenic effects were observed (ref. 9).

Aquatic toxicity: TLm 96: >1,000 ppm (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 800 = 3.6 \times 10^4$ μg/m³

Water, Health: $15 \times 3.6 \times 10^4 = 5.4 \times 10^5$ μg/ℓ

Land, Health: $0.2 \times 5.4 \times 10^5 = 1.1 \times 10^5$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 1000 = 1.0 \times 10^5$ μg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^5 = 2.0 \times 10^4$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 800 = 86$ μg/m³

$EPC_{AH3} = 0.081 \times 800 = 65$ μg/m³

$EPC_{WH1} = 15 \times 65 = 975$ μg/ℓ

$EPC_{WH2} = 0.4 \times 800 = 320$ μg/ℓ

$EPC_{LH} = 0.2 \times 320 = 64$ μg/g

$EPC_{WE1} = 50 \times 1000 = 50{,}000$ μg/ℓ

$EPC_{LE} = 0.2 \times 50{,}000 = 10{,}000$ μg/ℓ

08B080
γ-BUTYROLACTONE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			3.6E4		65		
Water, $\mu g/l$ (ppm Wt)			5.4E5	1.0E5	320	50,000	
Land, $\mu g/g$ (ppm Wt)			1.1E5	2.0E4	64	10,000	

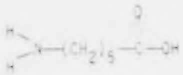
*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			65		
Water, $\mu g/l$ (ppm Wt)			320	50,000	
Land, $\mu g/g$ (ppm Wt)			64	10,000	

CATEGORY: 08
6-AMINOHEXANOIC ACID $C_6H_{13}O_2N$ (aminocaproic acid,
6-aminocaproic acid)
A solid. 088100

WLN: Z5VQ

STRUCTURE:



PROPERTIES:

Molecular wt: 131.18; mp: 202-3; soluble in water

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

TOXIC PROPERTIES, HEALTH EFFECTS:

Acute toxic properties of 6-aminohexanoic acid are not reported. On the basis of LD_{50} data for structurally similar compounds, it is reasonable to expect the lethal dose to be >1,000 mg/kg (see table below).

Compound	LD_{50}	
Butyric acid	(intravenous, mouse)	800 mg/kg
4-Amino butyric acid	(intravenous, mouse)	2,748 mg/kg
Hexanoic acid	(oral, rat)	3,000 mg/kg

6-Aminohexanoic acid is reported to produce teratogenic effects in rats when administered orally for 60 days (ref. 3). The EPA/NIOSH ordering number based on teratogenicity is 4,111 with the lowest dosage being 150 g/kg. The adjusted ordering number is 0.027.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

* **MINIMUM ACUTE TOXICITY CONCENTRATIONS**:

Air, Health:	$45 \times 1,000 = 4.5 \times 10^4\ \mu g/m^3$	Air, Ecology:
Water, Health:	$15 \times 4.5 \times 10^4 = 6.8 \times 10^5\ \mu g/\ell$	Water, Ecology:
Land, Health:	$0.2 \times 6.8 \times 10^5 = 1.4 \times 10^5\ \mu g/g$	Land, Ecology:

* **ESTIMATED PERMISSIBLE CONCENTRATIONS**:

$EPC_{AH2} = 0.107 \times 1,000 = 107\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 1,000 = 81\ \mu g/m^3$

$EPC_{WH1} = 15 \times 81 = 1,215\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 1,000 = 400\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 400 = 80\ \mu g/g$

*Based on data for structurally similar compounds.

MULTIMEDIA ENVIRONMENTAL GOALS

08B100
6-AMINOHEXANOIC ACID

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent †		B. Ambient Level Goal* †		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			4.5E4		81		
Water, $\mu g/l$ (ppm Wt)			6.8E5		400		
Land, $\mu g/g$ (ppm Wt)			1.4E5		80		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects †	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			81		
Water, $\mu g/l$ (ppm Wt)			400		
Land, $\mu g/g$ (ppm Wt)			80		

† Based on data for structurally similar compounds.

REFERENCES: CATEGORY 8B

Carboxylic Acids and Derivatives with Additional Functional Groups - Carboxylic Acids

1. Fassett, D. W. Organic Acids, Anhydrides, Lactones, Acid Halides and Amides, Thioacids. Industrial Hygiene and Toxicology, Second Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, p. 1771-1837, 1962.

2. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

3. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

4. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

5. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 4, Lyon, France. A World Health Organization (WHO), Geneva (1974).

6. Radding, S. B., et al. Review of the Environmental Fate of Selected Chemicals. Prepared by Stanford Research Institute under contract 68-01-2681 for Office of Toxic Substances, Environmental Protection Agency, Washington, DC. EPA 560/4-75-001 (1977).

7. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

8. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29 Code Federal Regulations, Part 1910.

9. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 11, Lyon, France. A World Health Organization Publication (WHO), Geneva (1976).

10. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

CATEGORY 8

CARBOXYLIC ACIDS AND DERIVATIVES

SUBCATEGORY: 8C - Amides

Summary of Subcategory

Total number of compounds in subcategory	3
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	0

Consent Decree compounds included in subcategory: None

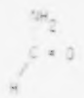
CATEGORY: 3C

WLN: ZVH

FORMAMIDE: CH_3NO (formic acid amide, formylamine, methanamide). 08C020.

A colorless, hygroscopic, viscous, oily liquid.

STRUCTURE:



PROPERTIES:

Molecular wt: 45.04; mp: 2.55; bp: 210.7; decomposes; d: 1.1334^{20}_{4}; vap. press.: 29.7 mm at 129.4°; miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formamide is a derivative of formic acid and in water hydrolyzes to form the parent acid. Formamide is obtained by heating ammonium formate in the presence of ammonia. At its boiling point, it decomposes to ammonia and carbon monoxide.

TOXIC PROPERTIES, HEALTH EFFECTS:

Animal experiments have indicated that repeated exposure to formamide results in cumulative effects, although toxicity by all routes is low.

Formamide is not reported to have presented any serious toxicologic hazards in industrial use (ref. 1). Acute toxicity is considered much lower than for dimethyl formamide.

LD_{50} (oral, rat): 7,500 mg/kg. (ref. 2).

Formamide has caused teratogenic effects when 6 g/kg were administered to pregnant rats. The EPA/NIOSH ordering number is 4101, and the adjusted ordering number is 0.7.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 30 mg/m^3 (20 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 3.0×10^4 $\mu g/m^3$ (20 ppm)
Water, Health: $15 \times 3.0 \times 10^4 = 4.5 \times 10^5$ $\mu g/l$
Land, Health: $0.2 \times 4.5 \times 10^5 = 9.0 \times 10^4$ $\mu g/g$

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 30/420 = 71$ $\mu g/m^3$
$EPC_{AH1a} = 20/420 = 0.05$ ppm
$EPC_{WH1} = 15 \times 71 = 1{,}070$ $\mu g/l$
$EPC_{WH2} = 13.8 \times 30 = 414$ $\mu g/l$
$EPC_{LH} = 0.2 \times 414 = 30$ $\mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

08C020
FORMAMIDE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.0E4 (20)		71 (0.05)		
Water, μg/l (ppm Wt)			4.5E5		414		
Land, μg/g (ppm Wt)			9.0E4		80		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			71 (0.05)		
Water, μg/l (ppm Wt)			414		
Land, μg/g (ppm Wt)			80		

CATEGORY: 3C

ACETAMIDE: C_2H_5NO (ethanamide, methanecarboxamide acetic acid amide) 08C040
A solid; odorless when pure, but frequently has a mousy odor.

WLN:

STRUCTURE:

PROPERTIES:

Molecular wt: 59.07; mp: 82.3; bp: 221.2^{760}; d: 1.159^{20}_{4}; vap. press: 1 mm at 65°; pK_b: 15 soluble in water, 98 g/100 ml.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Acetamide is used as a solubilizer, a plasticizer, and a stabilizer (ref. 3). It is formed from ammonium acetate distillation (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Acetamide is a mild irritant (ref. 3). It does not appear to pose a grave risk to human health (ref. 4). The effect of acetamide can be largely inhibited by simultaneous feeding of arginine glutamate, a substance which counteracts the toxic action of ammonia in the mammal (ref. 4).
LD_{50} (oral, rat): 30 g/kg (ref. 4).

Exposure to acetamide is reported to cause cancer in animals (ref. 2). The EPA/NIOSH ordering number is 4111. The lowest dosage to cause a carcinogenic effect is 456 g/kg. The adjusted ordering number is 0.009.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 30{,}000 = 1.35 \times 10^6$ μg/m³ — Air, Ecology:

Water, Health: $15 \times 1.35 \times 10^6$ μg/l $= 2.04 \times 10^7$ μg/l — Water, Ecology:

Land, Health: $0.2 \times 2.04 \times 10^7 = 4.08 \times 10^6$ μg/g — Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 30{,}000 = 3{,}210$ μg/m³

$EPC_{AH3} = 0.081 \times 30{,}000 = 2{,}430$ μg/m³

$EPC_{WH1} = 15 \times 2{,}430 = 36{,}450$ μg/l

$EPC_{WH2} = 0.4 \times 30{,}000 = 12{,}000$ μg/l

$EPC_{LH} = 0.2 \times 12{,}000 = 2{,}400$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08C040 ACETAMIDE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.4E6		2,430		
Water, μg/l (ppm Wt)			2.0E7		12,000		
Land, μg/g (ppm Wt)			4.1E6		2,400		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			2,430		
Water, μg/l (ppm Wt)			12,000		
Land, μg/g (ppm Wt)			2,400		

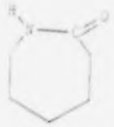
CATEGORY: 9C

6-HEXANELACTAM: $C_6H_{11}NO$ (e-caprolactam, 6-amino-hexanoic lactam): 08C060

A white crystal with unpleasant odor and taste, hygroscopic.

WLN: T7MVTJ

STRUCTURE:



PROPERTIES:

Molecular wt: 113.16; mp: 69-71; bp: 139^{12}; vap. press: 6 mm at 120°; highly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

6-Hexanelactam has been reported in samples of finished drinking water twice (ref. 5). Odor threshold is 0.3 mg/m³ (ref. 1). It is used in the manufacture of polyamide type synthetic fibers (ref. 3). It is formed by rearrangement of cyclohexanone oxime (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Workers in spinning rooms where vapors consisted mainly of 6-caprolactam in various stages of polymerization at a mean concentration of 61 mg/m³ experienced bitter taste, nasal irritation, nervousness, and stomach disorder (ref. 1).

In studies of 6-hexanelactam metabolism in animals, the rabbit appeared to metabolize completely, whereas the rat excreted it only in part as an amino acid (ref. 1).

LD_{50} (oral, rat): 2,140 mg/kg (ref. 2).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1 mg/m³ (0.22 ppm) based on 6-hexanelactam present as dust and 5 ppm as vapor.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 1,000 μg/m³ (0.22 ppm)

Water, Health: $15 \times 1{,}000 = 1.5 \times 10^4$ μg/l

Land, Health: $0.2 \times 1.5 \times 10^4 = 3.0 \times 10^3$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1/420 = 2.38$ μg/m³

$EPCH_{AH1a} = 0.22/420 = 5 \times 10^{-4}$ ppm

$EPC_{WH1} = 2.38 \times 15 = 35.7$ μg/l

$EPC_{WH2} = 13.8 \times 1 = 13.8$ μg/l

$EPC_{LH} = 0.2 \times 13.8 = 3$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08C060
6-HEXANELACTAM

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E3 (0.22)		2.4 (0.0005)		
Water, $\mu g/l$ (ppm Wt)			1.5E4		13.8		
Land, $\mu g/g$ (ppm Wt)			3.0E3		3		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			2.4 (0.0005)		
Water, $\mu g/l$ (ppm Wt)			13.8		
Land, $\mu g/g$ (ppm Wt)			3		

REFERENCES: CATEGORY 8C

Carboxylic Acids and Derivatives - Amides

1. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

2. Christensen, H.E., and E.J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD. for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

3. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

4. Sax, N.I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

5. Shackelford, W. M., and L. H. Keith. Frequency of Organic Compounds Identified in Water. EPA Publication No. 600/4-76-062, December 1976.

CATEGORY 8

CARBOXYLIC ACIDS AND DERIVATIVES

SUBCATEGORY: 8D - Esters

Summary of Subcategory

Total number of compounds in subcategory	23
number of parent compounds with subspecies	4
number of subspecies	11
Number of parent compounds with no MEG values	1
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: 5

08D281	Dimethyl phthalate
08D282	Diethyl phthalate
08D283	Di-n-butyl phthalate
08D300	Di-2-ethylhexyl phthalate
08D320	Butyl benzyl phthalate

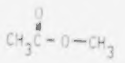
CATEGORY: 8D

METHYL ACETATE: $C_3H_6O_2$; 08D020

A colorless, volatile liquid; pleasant odor.

WLN:

STRUCTURE:



$$CH_3\overset{\overset{O}{\|}}{C}-O-CH_3$$

PROPERTIES:

Molecular wt: 74.08; mp: -98.7; bp: 57; vap press: 235 mm at 25^{0}; vap d: 255; d: 0.942_{4}^{20}; soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Methyl acetate is used as a lacquer solvent (ref. 1) and in the manufacture of artificial leathers (ref. 2). The threshold for odor recognition is 0.50-550 mg/m^3 (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methyl acetate is narcotic but less so than the higher molecular weight members of the acetate series (ref. 4). It also has an irritant effect and is stronger than the higher molecular weight members of the acetate series (ref. 4).

Physiological effects consist of signs of irritation of the eyes, nose and throat followed by a relatively slow and gradual onset of narcosis with a slow recovery after exposure ceases. Tendency to acidosis results presumably from hydrolysis in vivo (ref. 1).

Severe toxic effects in man have been reported for exposure to 500 ppm methyl acetate over 60 minutes (ref. 3).

LD_{Lo} (oral, rat): 4,800 mg/kg (ref. 5).

Aquatic toxicity rating TLm 96: 1000-100 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 610 mg/m^3 (200 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 610 - 6.1 \times 10^5\ \mu g/m^3$ (200 ppm)

Water, Health: $15 \times 6.1 \times 10^5 = 9.15 \times 10^6\ \mu g/\ell$

Land, Health: $0.2 \times 9.15 \times 10^6 = 1.83 \times 10^6\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/\ell$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 610/420 = 1.45 \times 10^3\ \mu g/m^3$

$EPC_{AH1a} = 200/420 = 0.48$ ppm

$EPC_{WH1} = 15 \times 1.45 \times 10^3 = 2.17 \times 10^4\ \mu g/\ell$

$EPC_{WH2} = 13.8 \times 610 = 8{,}418\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 8{,}418 = 1{,}684\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5{,}000\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

08D020
METHYL ACETATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
Category	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.1E5 (200)		1,450		
Water, $\mu g/l$ (ppm Wt)			9.15E6	1.0E4	8,420	5,000	
Land, $\mu g/g$ (ppm Wt)			1.83E6	2.0E3	1,680	1,000	

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,450 (.48)		
Water, $\mu g/l$ (ppm Wt)			8,420	5,000	
Land, $\mu g/g$ (ppm Wt)			1,680	1,000	

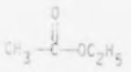
CATEGORY: 8D

ETHYL ACETATE: $C_4H_8O_2$. 08D040

Clear, volatile, flammable liquid, fruity odor.

WLN:

STRUCTURE:



$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-OC_2H_5$

PROPERTIES:

Molecular wt: 88.10; mp: -82.4°; bp: 77°; vap. press: 100 mm at 25°C; vap. d: 3.04; d: 1.02.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Used as a lacquer solvent and in the manufacture of artificial fruit essences, perfumes, photographic films, and smokeless powder (ref. 2). Ethyl acetate has been identified in ground water and in the finished drinking water (ref. 6).

The threshold of odor recognition is 0.60-180 mg/m³ (ref. 7).

TOXIC PROPERTIES, HEALTH EFFECTS:

Ethyl acetate has the reputation of being one of the least toxic of the volatile organic solvents. Men exposed regularly to concentrations ranging from 375-1500 ppm for several months showed no unusual signs or symptoms.

Repeated or prolonged exposure to ethyl acetate can cause dermatitis. High concentrations have a narcotic effect and can cause congestion of the liver and kidneys (ref. 4).

Physiological effects consist of signs of irritation of the eyes, nose, and throat followed by a relatively slow onset of narcosis with a slow recovery after exposure ceases (ref. 1). Tendency to acidosis results presumably from hydrolysis in vivo.

LD_{50} (oral, rat): 5,600 mg/kg (ref 4).

Aquatic toxicity Rating: TLm 96: 1000-100 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1,400 mg/m³ (400 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 1{,}400 = 1.4 \times 10^6$ µg/m³ (400)

Water, Health: $15 \times 1.4 \times 10^6 = 2.1 \times 10^7$ µg/ℓ

Land, Health: $0.2 \times 2.1 \times 10^7 = 4.2 \times 10^6$ µg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ µg/ℓ

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 1{,}400/420 = 3.33 \times 10^3$ µg/m³

$EPC_{AH1a} = 400/420 = .95$ ppm

$EPC_{WH1} = 15 \times 3.33 \times 10^3 = 4.99 \times 10^4$ µg/ℓ

$EPC_{WH2} = 13.8 \times 1{,}400 = 1.93 \times 10^4$ µg/ℓ

$EPC_{LH} = 0.2 \times 1.93 \times 10^4 = 3.86 \times 10^3$ µg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ µg/ℓ

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D040
ETHYL ACETATE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.4E6 (400)		3,330		
Water, $\mu g/l$ (ppm Wt)			2.1E7	1.0E4	19,300	5,000	
Land, $\mu g/g$ (ppm Wt)			4.2E6	2.0E3	3,860	1,000	

*To be multiplied by dilution factor

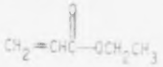
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			3,330		
Water, $\mu g/l$ (ppm Wt)			19,300	5,000	
Land, $\mu g/g$ (ppm Wt)			3,860	1,000	

CATEGORY: 8D

ETHYL ACRYLATE: $C_5H_8O_2$. 08D060
(ethyl propenoate, 2-propenoic acid ethyl ether)
Liquid with a penetrating odor.

WLN: 2OV1O1

STRUCTURE:


$$CH_2{=}CH\overset{O}{\overset{\|}{C}}{-}OCH_2CH_3$$

PROPERTIES:

Molecular wt.: 100.13; mp: <-75°; bp: 99.5°; vap. p: 30 mm at 20°C.
Soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Threshold for odor is .00047 ppm (ref. 8). It is used in the manufacture of water emulsion paint vehicles, textiles, and papercoating, leather finish resins and adhesives. It imparts flexibility to hard finishes (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

Ethyl acrylate has marked irritant and lachrymatory properties causing salivation, conjunctival irritation and marked respiratory irritation and pulmonary edema at high concentrations. Prolonged contact with eye or skin may cause severe damage (ref. 9). Oral administration of 0.42 mg/kg of body weight in rabbits resulted in fatal poisoning, caused by severe local irritation of the gastro-enteric tract and toxic degenerative changes of cardiac, hepatic, renal, and splenic tissue (ref. 4).

LD_{50} (Oral-Rat) = 1000 mg/kg (ref. 5).
Aquatic toxicity: TLM 96 = 1000-100 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 100 mg/m^3 (25 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 100 = 1.0 \times 10^5$ μg/m^3 (25 ppm)
Water, Health: $15 \times 1.0 \times 10^5 = 1.5 \times 10^6$ μg/ℓ
Land, Health: $0.2 \times 1.5 \times 10^6 = 3.0 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/ℓ
Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 100/420 = 238$ μg/m^3
$EPC_{AH1a} = 25/420 = .06$ ppm
$EPC_{WH1} = 15 \times 238 = 3{,}570$ μg/ℓ
$EPC_{WH2} = 13.8 \times 100 - 1{,}380$ μg/ℓ
$EPC_{LH} = 0.2 \times 1{,}380 = 276$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/ℓ
$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D060
ETHYL ACRYLATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.0E5		240		
Water, $\mu g/l$ (ppm Wt)			1.5E6	1.0E4	1,380	5,000	
Land, $\mu g/g$ (ppm Wt)			3.0E5	2.0E3	280	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			240 (.06)		
Water, $\mu g/l$ (ppm Wt)			1,380	5,000	
Land, $\mu g/g$ (ppm Wt)			280	1,000	

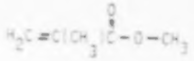
CATEGORY: 8D

METHYL METHACRYLATE: $C_5H_8O_2$. (methyl ester, methacrylic acid, methyl methylacrylate, methyl α-methacrylate, 2 methyl-methyl ester. OBD080

A colorless liquid.

WLN: IUYVOI

STRUCTURE:



$H_2C{=}C(CH_3)\overset{O}{\overset{\|}{C}}{-}O{-}CH_3$

PROPERTIES:

Molecular wt: 100.11; mp: -48; bp: 101.0; d: 0.936_4^{20}; vap. d: 3.45; vap. press: 40 mm at 25.5°; slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Methyl methacrylate has been reported in samples taken from public drinking water supplies, with the highest concentration reported as <1.0 μg/l (refs. 6,10). It is a common air contaminant (ref. 4). Odor threshold is 0.86 μg/m³, or 0.21 ppm (ref. 8).

Methyl methacrylate is used in the manufacture of methacrylate resins and plastics, such as Lucite and Plexiglass (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

The Connecticut Department of Health found that a concentration of 200 ppm methyl methacrylate was tolerated by workers without complaint, although a concentration of 125 ppm is reported to produce irritant effects. A concentration of 2,300 ppm was unbearable to workers (ref. 9).

LD_{50} (oral, rat): 9.4 g/kg (ref. 4).

LC_{50} (inhalation, rat): 3,750 ppm (ref. 5).

Methyl methacrylate has been found to be carcinogenic to rats (ref. 5). The EPA/NIOSH ordering number is 4,101, the lowest dosage to produce a carcinogenic response is 787 mg/kg, and the adjusted ordering number is 5.

Aquatic toxicity: TLm 96: 1,000-100 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 410 mg/m^3 (100 ppm).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/5 = 1.4 \times 10^4$ μg/m^3

Water, Health: $15 \times 1.4 \times 10^4 = 2.1 \times 10^5$ μg/l

Land, Health: $0.2 \times 2.1 \times 10^5 = 4.2 \times 10^4$ μg/g

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4$ μg/l

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2{,}000$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 410/420 = 976$ μg/m^3

$EPC_{AH1a} = 410/420 = .98$ ppm

$EPC_{WH1} = 15 \times 976 = 1.46 \times 10^4$ μg/ℓ

$EPC_{WH2} = 13.8 \times 410 = 5.66 \times 10^3$ μg/ℓ

$EPC_{LH} = 0.2 \times 5.66 \times 10^3 = 1.132 \times 10^3$ μg/g

$EPC_{AC2} = 10^3/6 \times 5) = 33.3$ μg/m^3

$EPC_{WC} = 15 \times 33.3 = 500$ μg/ℓ

$EPC_{LC} = 0.2 \times 500 = 100$ μg/g

$EPC_{WE1} = 50 \times 100 = 5{,}000$ μg/l

$EPC_{LE} = 0.2 \times 5{,}000 = 1{,}000$ μg/g

METHYL METHACRYLATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.4E4		33.3		
Water, μg/l (ppm Wt)			2.1E5	1.0E4	500	5,000	<1.0+
Land, μg/g (ppm Wt)			4.2E4	2.0E3.	100	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			980 (.98)		33.3
Water, μg/l (ppm Wt)			5,700	5,000	500
Land, μg/g (ppm Wt)			1,100	1,000	100

+Public drinking water.

CATEGORY: 8D

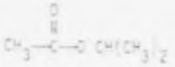
PROPYL ACETATES: $C_5H_{10}O_2$: 08D100

n-PROPYL ACETATE: 08D101

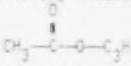
ISOPROPYL ACETATE: 08D102

WLN: 3OV1

STRUCTURE:


$CH_3-\overset{\overset{O}{\|}}{C}-O\ CH(CH_3)_2$

Isopropyl acetate


$CH_3-\overset{\overset{O}{\|}}{C}-O-C_3H_7$

n-Propyl acetate

PROPERTIES:

	molecular wt.	mp	bp	vap press	vap d	d
n-Propyl acetate	102.13	-92.5	101.6	35 mm at 25°C	3.5	1.11
Isopropyl acetate	102.13	-73.4	88.9	73 mm at 25°C	3.5	1.24

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Used as a lacquer solvent (ref. 1) and solvent for resins, cellulose derivatives and plastics (ref. 4). Odor recognition level for n-propyl acetate is 70 mg/m^3 (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

Physiological effects consist of signs of irritation of eyes, nose and throat followed by relatively slow and gradual onset of narcosis (ref. 1); after effects are slight and recovery quick from even a deep narcosis (ref. 4). Repeated or prolonged inhalation of high concentrations of n-propyl acetate have been shown to produce death, although no industrial injury has been reported as occurring to workmen (ref. 4).

n-Propyl acetate appears more toxic than isopropyl or ethyl acetate, but less toxic than n-butyl acetate (ref. 9).

LD_{50} (oral, rat): 9,800 mg/kg (ref. 5).

Aquatic toxicity rating TLm 96: 1000-100 ppm (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

n-propyl acetate: TLV: 840 mg/m^3 (200 ppm)

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 840 = 8.4 \times 10^5\ \mu g/m^3$

Water, Health: $15 \times 8.4 \times 10^5 = 1.26 \times 10^7\ \mu g/l$

Land, Health: $0.2 \times 1.26 \times 10^7 = 2.52 \times 10^6\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 100 = 1.0 \times 10^4\ \mu g/l$

Land, Ecology: $0.2 \times 1.0 \times 10^4 = 2.0 \times 10^3\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 840/420 = 2 \times 10^3\ \mu g/m^3$

$EPC_{AH1a} = 840/420 = 2$ ppm

$EPC_{WH1} = 15 \times 2 \times 10^3 = 3.0 \times 10^4\ \mu g/l$

$EPC_{WH2} = 13.8 \times 840 = 1.12 \times 10^4\ \mu g/l$

$EPC_{LH} = 0.2 \times 1.12 \times 10^4 = 2.22 \times 10^3\ \mu g/g$

$EPC_{WE1} = 50 \times 100 = 5 \times 10^3\ \mu g/l$

$EPC_{LE} = 0.2 \times 5{,}000 = 1.0 \times 10^3\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

08D100
PROPYL ACETATES

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			8.4E5		2,000 (2)		
Water, $\mu g/l$ (ppm Wt)			1.26E7	1.0E4	11,200	5,000	
Land, $\mu g/g$ (ppm Wt)			2.57E6	2.0E3	2,220	1,000	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			2,000 (2)		
Water, $\mu g/l$ (ppm Wt)			11,200	5,000	
Land, $\mu g/g$ (ppm Wt)			2,220	1,000	

CATEGORY: 8D

WLN:

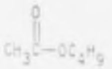
STRUCTURE:

BUTYL ACETATES: $C_6H_{12}O_2$. 08D120

n-BUTYL ACETATE (butyl ethanoate). 08D121. A liquid with sweet taste.

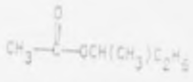
sec-BUTYL ACETATE (α-methylpropylethanoate). 08D122.

ISOBUTYL ACETATE (β-methylpropylethanoate). 08D123. A liquid with sweet taste.



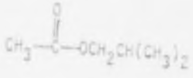
$CH_3C(=O)—OC_4H_9$

n-butyl



$CH_3—C(=O)—OCH(CH_3)C_2H_5$

sec-butyl



$CH_3—C(=O)—OCH_2CH(CH_3)_2$

Isobutyl

PROPERTIES:

	mol. wt.	mp	Bp	vap. press.	vap. d	d(g/ml)	solubility in water
n-butyl acetate	116.16	-76.8	124-126	15 mm at 25°C	4.0	0.88^{18}	7
sec-butyl acetate	116.16		112-113	24 mm at 25°C	4.0	0.87^{20}	3
Isobutyl acetate	116.16	-98.85	117.2	20 mm at 25°C	4.0	0.87^{20}	0.6

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Butyl acetates are generally used as lacquer solvents (ref. 1). n-Butyl acetate is used in the manufacture of artificial leathers, plastics, and safety glass (ref. 2).

The odor recognition threshold for n-butyl acetate is 3.1-3.6 mg/m^3 (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

n-Butyl acetate begins to cause throat irritation in man at 200 ppm. The irritation becomes severe by 300 ppm (ref. 8) and toxic effects have been recorded at concentrations of 2000 ppm over 60 minutes (ref. 3).

sec-Butyl acetate is less irritating than n-butyl acetate (ref. 8). However, isobutyl acetate appears to be somewhat more toxic than the normal isomer (ref. 8).

	LD_{50}(Oral-Rat)	Aquatic Toxicity
n-butyl acetate	14 gm/kg	TLM 96: 100-10 ppm
sec-butyl acetate		TLM 96: 100-10 ppm
Isobutyl acetate	15 gm/kg	TLM 96: >1000 ppm

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV: 710 mg/m^3 (150 ppm) for n-butyl acetate.

TLV: 950 mg/m^3 (200 ppm) for sec-butyl acetate.

TLV: 700 mg/m^3 (150 ppm) for isobutyl acetate.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 700 = 7.0 \times 10^5\ \mu g/m^3$

Water, health: $15 \times 7.0 \times 10^5 = 1.05 \times 10^7\ \mu g/\ell$

Land, Health: $0.2 \times 7.0 \times 10^7 = 2.1 \times 10^6\ \mu g/g$

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000\ \mu g/\ell$

Land, Ecology: $0.2 \times 1{,}000 = 200\ \mu g/g$

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 700/420 = 1{,}666\ \mu g/m^3$

$EPC_{AH1a} = 700/420 = 1.67$ ppm

$EPC_{WH1} = 15 \times 1{,}666 = 2.45 \times 10^4\ \mu g/\ell$

$EPC_{WH2} = 13.8 \times 700 = 9{,}660\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 9{,}660 = 1{,}932\ \mu g/g$

$EPC_{WE1} = 50 \times 10 = 500\ \mu g/\ell$

$EPC_{LE} = 0.2 \times 500 = 100\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

08D120
BUTYL ACETATES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.0E5		1,670 (1.67)		
Water, $\mu g/l$ (ppm Wt)			1.05E7	1.0E3	9,660	500	
Land, $\mu g/g$ (ppm Wt)			2.1E6	2.0E2	1,930	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,670 (1.67)		
Water, $\mu g/l$ (ppm Wt)			9,660	500	
Land, $\mu g/g$ (ppm Wt)			1,930	100	

CATEGORY: 8D

WLN:

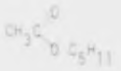
AMYL ACETATES: $C_7H_{14}O_2$. 08D140

n-AMYL ACETATE: (amyl acetic ether). Colorless liquid, pear or banana-like odor. 08D141

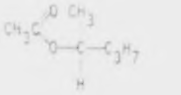
sec-AMYL ACETATE: (2-pentyl acetate). Colorless liquid. 08D142.

ISOAMYL ACETATE: (3-methyl-1-butanol acetate)(banana oil). A liquid with a banana-like odor. 08D143.

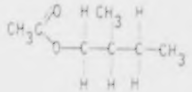
STRUCTURE:



n-amyl acetate



sec-amyl acetate



isoamyl acetate

PROPERTIES:

	mol. wt.	mp.	bp	d.	vap.d.	solubility in water
n-amyl acetate	130.18	-78.5	148^{737}	0.879^{20}	4.48	slightly soluble
sec-amyl acetate	130.18		120	0.862	4.48	slightly soluble
isoamyl acetate	130.18	-78.5	142.0	0.876	4.49	slightly soluble

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Amyl acetates are important lacquer solvents (ref. 1).

The biological half-life of amyl acetate is less than 20 minutes (ref. 11).

TOXIC PROPERTIES, HEALTH EFFECTS:

High concentrations of amyl acetates are reported to produce irritation of eye, nose, and throat, and onset of narcosis (ref. 1). The irritant and narcotic properties of the esters become greater as the molecular weights and boiling points increase. The sec-amyl acetates are more volatile than the primary isomers, and appear to be somewhat less toxic (ref. 9). Human exposure for 1/2 hr at 1,000 ppm resulted in irritation, increased pulse, and fatigue (ref. 9). Isoamyl acetate is reported to be 2.6 times as narcotic as ethyl acetate (ref. 9).

	TC_{Lo} (inhalation, human)	LD_{50} (oral, rat)	Aquatic toxicity: TLm 96 (ref. 5).
n-amyl acetate	188 ppm/30 minutes		100-10 ppm
sec-amyl acetate	200 ppm		
amyl acetate (mixed isomers)		4,950 mg/kg	

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 525 mg/m³ (100 ppm) for n-amyl acetate
TLV = 525 mg/m³ (100 ppm) for isoamyl acetate
TLV = 650 mg/m³ (125 ppm) for sec-amyl acetate

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $10^3 \times 525 = 5.25 \times 10^5$ µg/m³

Water, Health: $15 \times 5.25 \times 10^5 = 7.88 \times 10^6$ µg/l

Land, Health: $0.2 \times 7.88 \times 10^6 = 1.58 \times 10^6$ µg/g

Air, Ecology:

Water, Ecology: $100 \times 10 = 1{,}000$ µg/l

Land, Ecology: $0.2 \times 1{,}000 = 200$ µg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 525/420 = 1{,}250$ µg/m³

$EPC_{AH1a} = 100/420 = 0.24$ ppm

$EPC_{WH1} = 15 \times 1{,}250 = 1.88 \times 10^4$ µg/l

$EPC_{WH2} = 13.8 \times 525 = 7{,}245$ µg/l

$EPC_{LH} = 0.2 \times 7{,}245 = 1{,}449$ µg/g

$EPC_{WE_1} = 50 \times 10 = 500$ µg/l

$EPC_{LE} = 0.2 \times 500 = 100$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D140
AMYL ACETATES

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.2E5		1,250 (0.24)		
Water, $\mu g/l$ (ppm Wt)			7.88E6	1.0E3	7,250	500	
Land, $\mu g/g$ (ppm Wt)			1.58E6	2.0E2	1,450	100	

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

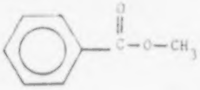
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,250 (0.24)		
Water, $\mu g/l$ (ppm Wt)			7,250	500	
Land, $\mu g/g$ (ppm Wt)			1,450	100	

CATEGORY: 8D

METHYL BENZOATE: $C_8H_8O_2$ (methyl ester of benzoic acid, methylbenzene carboxylate). 08D160
A colorless, transparent liquid with a pleasant odor.

WLN: 1OVR

STRUCTURE:



PROPERTIES:

Molecular wt: 136.14; mp: -12.4; bp: 199.5; d: 1.094_4^{20}; vap. d: 4.69; vap. press: 1 mm at 39.0°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Methyl benzoate has been reported to be found in samples taken from drinking water supplies, with the highest reported concentration at <0.01 μg/l (refs. 6,10). It is used in perfumes (ref. 2) and as a dye carrier in dyeing of polyester fibers, additives for disinfectants, soy sauce and pesticides and as a solvent for cellulose, resins, and rubber (ref. 7).

TOXIC PROPERTIES, HEALTH EFFECTS:

Methyl benzoate is a moderate irritant (ref. 7).

LD_{50} (oral, rat): 1,350 mg/kg (ref. 5).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 1{,}350 = 6.08 \times 10^4$ μg/m^3	Air, Ecology:
Water, Health:	$15 \times 6.08 \times 10^4 = 9.11 \times 10^5$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 9.12 \times 10^5 = 1.82 \times 10^5$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}350 = 144.5$ μg/m^3

$EPC_{AH3} = 0.081 \times 1{,}350 = 109.4$ μg/m^3

$EPC_{WH1} = 15 \times 109.4 = 1{,}641$ μg/l

$EPC_{WH2} = 0.4 \times 1{,}350 = 540$ μg/l

$EPC_{LH} = 0.2 \times 540 = 108$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D160
METHYL BENZOATE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.08E4		110		
Water, $\mu g/l$ (ppm Wt)			9.11E5		540		<0.01[+]
Land, $\mu g/g$ (ppm Wt)			1.82E5		110		

*To be multiplied by dilution factor

	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			110		
Water, $\mu g/l$ (ppm Wt)			540		
Land, $\mu g/g$ (ppm Wt)			110		

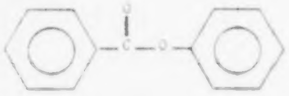
[+] Public drinking water supplies.

CATEGORY: 8D

PHENYL BENZOATE: $C_{13}H_{10}O_2$ (benzoic acid phenyl ester). 08D138
A colorless crystal with a geranium odor.

WLN:

STRUCTURE:



PROPERTIES:

Molecular wt: 198.2; bp: 70-1; mp: 314; d: 1.235; vap. press: 1 mm at 106.8°; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Phenyl benzoate is used as a plasticizer and in perfumes and insecticides (ref. 7). It has been reported in samples taken from river water and from finished drinking water (ref. 6).

TOXIC PROPERTIES, HEALTH EFFECTS:

Toxicological data for phenyl benzoate are not available at this time.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

MULTIMEDIA ENVIRONMENTAL GOALS

08D180
PHENYL BENZOATE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)							
Water, $\mu g/l$ (ppm Wt)							
Land, $\mu g/g$ (ppm Wt)							

*To be multiplied by dilution factor

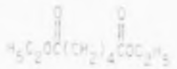
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)					
Water, $\mu g/l$ (ppm Wt)					
Land, $\mu g/g$ (ppm Wt)					

CATEGORY: 8D

DIETHYL ADIPATE: $C_{10}H_{18}O_4$: 080200
(Ethyl adipate, ethyl δ-carboethoxyvalerate)

WLN:

STRUCTURE:


$H_5C_2O\overset{O}{\overset{\|}{C}}(CH_2)_4\overset{O}{\overset{\|}{C}}OC_2H_5$

PROPERTIES:

Molecular wt.: 202.28; mp: -19.8°; bp: 245; d: 1.0076_4^{20}

Insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Adipates are used extensively as plasticers.

TOXIC PROPERTIES, HEALTH EFFECTS:

None of the adipates possess a very high degree of acute toxicity and their irritant effect on skin and eyes is very slight (ref. 1).
LD_{50} (Oral-Rat) = >1.6g/kg (ref. 1).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 45 x >1,600 = >7.2 x 10^4 μg/m^3
Water, Health: 15 x >7.2 x 10^4 = >1.08 x 10^6 μg/ℓ
Land, Health: 0.2 x >1.08 x 10^6 = >2.16 x 10^5 μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH2} = 0.107 x >1,600 = >171.2 μg/m^3
EPC_{AH3} = 0.081 x >1,600 = >129.6 μg/m^3
EPC_{WH1} = 15 x >129.6 = >1,944 μg/ℓ
EPC_{WH2} = 0.4 x >1,600 = >640 μg/ℓ
EPC_{LH} = 0.2 x >640 = >128 μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D200
DIETHYL ADIPATE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			7.2E4		130		
Water, μg/l (ppm Wt)			1.08E6		640		
Land, μg/g (ppm Wt)			2.16E5		130		

*To be multiplied by dilution factor

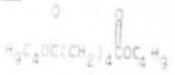
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			130		
Water, μg/l (ppm Wt)			640		
Land, μg/g (ppm Wt)			130		

CATEGORY: 30

WLN: 40V4V04

DIBUTYL ADIPATE: $C_{14}H_{26}O_4$: 08D220
(Butyl adipate, Di-N-butyl adipate)

STRUCTURE:



$$H_9C_4O\overset{O}{C}(CH_2)_4\overset{O}{\overset{\|}{C}}OC_4H_9$$

PROPERTIES:

Molecular wt.: 258.36 mp: -32.4°; bp: 165^{10}; d: 0.961^{20}_{4}
Insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Adipate esters are used extensively as plasticers.

TOXIC PROPERTIES, HEALTH EFFECTS:

None of the adibates possess a very high degree of acute toxicity and their irritant effect on skin and eyes is very slight (ref. 1).

LD_{50} (oral,rat) = 12,900 mg/kg (ref. 1).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 12,900 = 5.81 \times 10^5$ μg/m³
Water, Health: $15 \times 5.8 \times 10^5 = 8.71 \times 10^6$ μg/ℓ
Land, Health: $0.2 \times 8.71 \times 10^6 = 1.74 \times 10^5$ μg/g

ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH2} = $0.107 \times 12,900 = 1.38 \times 10^3$ μg/m³
EPC_{AH3} = $0.081 \times 12,900 = 1.04 \times 10^3$ μg/m³
EPC_{WH1} = $15 \times 1.04 \times 10^3 = 1.57 \times 10^4$ μg/ℓ
EPC_{WH2} = $0.4 \times 12,900 = 5.16 \times 10^3$ μg/ℓ
EPC_{LH} = $0.2 \times 5.16 \times 10^3 = 1.03 \times 10^3$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D220
DIBUTYL ADIPATE

	EMISSION LEVEL GOALS						
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			5.81E5		1,040		
Water, $\mu g/l$ (ppm Wt)			8.71E6		5,160		
Land, $\mu g/g$ (ppm Wt)			1.74E6		1,030		

*To be multiplied by dilution factor

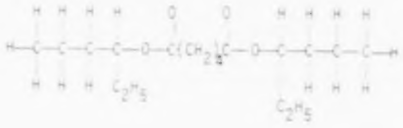
	AMBIENT LEVEL GOALS				
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			1,040		
Water, $\mu g/l$ (ppm Wt)			5,160		
Land, $\mu g/g$ (ppm Wt)			1,030		

CATEGORY: 80

WLN:

DI-2-ETHYLBUTYL ADIPATE: $C_{18}H_{34}O_4$: 08D240
(Bis-2-ethylbutyl adipic acid ester)

STRUCTURE:



$$H-C-C-C-C-O-\overset{O}{C}(CH_2)_4\overset{O}{C}-O-C-C-C-C-H$$

PROPERTIES:

Molecular wt.: 314.47; mp: -15°; bp: 200^{10}; d: 0.934^{25}_{4}
Insoluble in water

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Adipate esters are used extensively as plasticizers.

TOXIC PROPERTIES, HEALTH EFFECTS:

None of the adipates possess a very high degree of acute toxicity and their irritant effect on the skin and eyes is very slight (ref. 1).
LD_{50} (oral, rat): 5.6 g/kg (ref. 1).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 5{,}600 = 2.52 \times 10^5$ μg/m^3
Water, Health: $15 \times 2.52 \times 10^5 = 3.78 \times 10^6$ μg/ℓ
Land, Health: $0.2 \times 3.78 \times 10^6 = 7.56 \times 10^5$ μg/g

Air, Ecology:
Water, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 5{,}600 = 599.2$ μg/m^3
$EPC_{AH3} = 0.081 \times 5{,}600 = 453.6$ μg/m^3
$EPC_{WH1} = 15 \times 453.6 = 6{,}804$ μg/ℓ
$EPC_{WH2} = 0.4 \times 5{,}600 = 2{,}240$ μg/ℓ
$EPC_{LH} = 0.2 \times 2{,}240 = 448$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

08D240
DI-2-ETHYLBUTYL ADIPATE

EMISSION LEVEL GOALS

	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, µg/m^3 (ppm Vol)			2.52E5		450		
Water, µg/l (ppm Wt)			3.78E6		2,240		
Land, µg/g (ppm Wt)			7.56E5		450		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS

	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m^3 (ppm Vol)			450		
Water, µg/l (ppm Wt)			2,240		
Land, µg/g (ppm Wt)			450		

X

11A040

p-DIMETHYLAMINOAZOBENZENE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, µg/m³ (ppm Vol)			2.0F3		5		
Water, µg/l (ppm Wt)			3.0E4		75		
Land, µg/g (ppm Wt)			6.0E3		15		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m³ (ppm Vol)			16.2		5
Water, µg/l (ppm Wt)			80		75
Land, µg/g (ppm Wt)			16		15

REFERENCES: CATEGORY 11A

Azo Compounds, Hydrazine Derivatives - Azo Compounds

1. Sutton, W. L. Heterocyclic and Miscellaneous Nitrogen Compounds. *Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2*, F. A. Patty, Ed., Interscience Publixhers, New York, NY (1963).

2. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol 7, Lyon, France. A World Health Organization (WHO), Geneva (1974).

3. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

4. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared for Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

5. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 8, Lyon, France. A World Health Organization Publication (WHO), Geneva (1975).

6. Hueper, W. C., and W. D. Conway. Chemical Carcinogenesis and Cancers. Charles C. Thomas, Publishers, Springfield, IL (1964).

7. Shepard, T. H. Catalog of Teratogenic Agents. Johns Hopkins University Press, Baltimore, MD (1973).

8. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

9. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29 Code Federal Regulations, Part 1910.

10. Windholz, M., Ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, Ninth Edition. Merck & Co., Inc., Rahway, NJ (1976).

CATEGORY 11

AZO COMPOUNDS, HYDRAZINE DERIVATIVES

SUBCATEGORY: 11B - Hydrazine Derivatives

Summary of Subcategory

Total number of compounds in subcategory	4
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: 1

11B080	1,2-Diphenylhydrazine

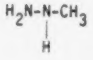
CATEGORY: 11B

WLN: ZM1

MONOMETHYLHYDRAZINE: CH_6N_2 (methylhydrazine). 11B020

Monomethylhydrazine is a liquid at room temperature, fumes in air, and has an ammonia-like odor.

STRUCTURE:



$$H_2N\text{-}\underset{H}{\underset{|}{N}}\text{-}CH_3$$

PROPERTIES:

Molecular wt: 46.08; mp: < -80; bp: 87^{745}; vap. press.: 49.6 mm at 25° C (ref. 1); pK_a: 8.0 (ref. 2); soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Monomethylhydrazine is synthesized for use as a rocket fuel. It dissolves in water to give a weakly basic solution.

Monomethylhydrazine undergoes autooxidation in air to give nitrogen, methanol, carbon monoxide, acetaldehyde, and various carbon or nitrogen heterocyclic compounds (ref. 2).

The odor detection level for monomethylhydrazine is reported as 1-3 ppm (ref. 3).

TOXIC PROPERTIES, HEALTH EFFECTS:

As a group, hydrazine derivatives are local irritants, convulsants, and hemolytic agents which are absorbed by all routes of administration. Monomethylhydrazine is the most toxic of the methyl derivatives of hydrazine (refs. 1,2,3).

LD_{50}(oral, rat): 33 mg/kg.

LC_{50}(inhalation, rat): 74 ppm for 4 hours.

Monomethylhydrazine is reported to have caused both carcinogenic and teratogenic effects in animals. The EPA/NIOSH ordering number, based on carcinogenic potential or on teratogenic potential, is 3212. The lowest dose resulting in an oncogenic response is 3,000 mg/kg; the adjusted ordering number is 1. The lowest dose to produce a teratogenic effect is 100 mg/kg; the adjusted ordering number based on teratogenic potential is 32.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 0.35 mg/m^3 (0.2 ppm). This TLV does not recognize oncogenic or teratogenic potential of monomethylhydrazine.

Short term exposure limits have been recommended by the National Academy of Sciences--National Research Council as follows (ref. 2):

Short Term Public Limits

Time	Limit (25°C/760 mm.Hg)
10 min.	9 ppm (16.9 mg/m^3)
30 min.	3 ppm (5.6 mg/m^3)
60 min.	1.5 ppm (2.8 mg/m^3)

Methyl hydrazine is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 0.15 mg/m^3 as a 2-hour average (ref. 5).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 150 μg/m^3 (0.1 ppm)	Air, Ecology:
Water, Health: 15 x 150 = 2.25×10^3 μg/ℓ	Water, Ecology:
Land, Health: 0.2 x 2.25×10^3 = 450 μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.15/420 = 0.4$ μg/m^3

$EPC_{AH1a} = 0.1/420 = 0.0002$ ppm

$EPC_{WH1} = 15 \times 0.4 = 6$ μg/ℓ

$EPC_{WH2} = 13.8 \times 0.15 = 2$ μg/ℓ

$EPC_{LH} = 0.2 \times 2 = 0.4$ μg/g

$EPC_{AC2} = 10^3/(6 \times 1) = 167$ μg/m^3

$EPC_{WC} = 15 \times 167 = 2,500$ μg/ℓ

$EPC_{LC} = 0.2 \times 2,500 = 500$ μg/g

$EPC_{AT} = 10^3/(6 \times 32) = 5$ μg/m^3

$EPC_{WT} = 15 \times 5 = 75$ μg/ℓ

$EPC_{LT} = 0.2 \times 75 = 15$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X

11B020

MONOMETHYLHYDRAZINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.5E2 (0.1)		0.4 (0.0002)		
Water, $\mu g/l$ (ppm Wt)			2.25E3		2		
Land, $\mu g/g$ (ppm Wt)			4.5E2		0.4		

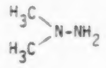
*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			0.4 (0.0002)		5
Water, $\mu g/l$ (ppm Wt)			2		75
Land, $\mu g/g$ (ppm Wt)			0.4		15

CATEGORY: 11B

WLN: ZN1&1

STRUCTURE:



N,N-DIMETHYLHYDRAZINE: $C_2H_8N_2$ (1,1-dimethylhydrazine, dimazine, unsymmetrical dimethylhydrazine). 11B040
A colorless liquid that fumes in air with an ammoniacal or "fishy" odor.

PROPERTIES:

Molecular wt: 60.11; bp: 63^{752}; d: 0.7914^{22}; vap. d: 2; vap. press.: 157 mm at 25° C; pK_a: 7.21 (ref. 2) miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

N,N-Dimethylhydrazine is synthesized almost exclusively for use as a rocket fuel. It is described as insensitive to shock (ref. 2), but can ignite spontaneously if absorbed on materials with large surface areas.

Solutions in water are weakly alkaline.

Odor recognition level for N,N-dimethylhydrazine is reported as 0.3 - 1 ppm (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

As a group, hydrazine derivatives are local irritants, convulsants, and hemolytic agents, which are absorbed by all routes of administration (ref. 1).

N,N-Dimethylhydrazine is not considered as toxic as hydrazine or monomethylhydrazine (ref. 1).

N,N-Dimethylhydrazine is reported to have caused cancer in mice but only at high dosages.

The EPA/NIOSH ordering number based on carcinogenic potential is 3111. The lowest dose to induce a carcinogenic response is reported as 7,902 mg/kg. The adjusted ordering number is 0.39.

LD_{50} (oral, rat): 122 mg/kg.

LC_{50} (inhalation, rat): 252 ppm for 4 hours.

Toxicity to plants: Seedlings (cotton, pinto bean, soybean, endive, squash) suffered severe injury when fumigated with 25-30 ppm (ref. 2). 25 ppm is approximately equivalent to 50 mg/m^3.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

TLV = 1 mg/m^3 (0.5 ppm).

Short term exposure limits have been recommended by the National Academy of Science--National Research Council as follows (ref. 2):

Time	Short Term Public Limits Limit (25° C/760 mm Hg.)
10 min.	50 ppm (127 mg/m^3)
30 min.	25 ppm (63.5 mg/m^3)
60 min.	15 ppm (38.2 mg/m^3)

1,1-Dimethyl hydrazine is the subject of a NIOSH Criteria Document. The NIOSH recommendation for occupational exposure is 0.15 mg/m^3 (0.075 ppm) as a 2-hour average (ref. 5).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 150 $\mu g/m^3$ (0.075 ppm)

Water, Health: $15 \times 150 = 2.25 \times 10^3$ $\mu g/\ell$

Land, Health: $0.2 \times 2.25 \times 10^3 = 450$ $\mu g/g$

Air, Ecology: 5×10^4 $\mu g/m^3$ (25 ppm)

Water, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH1} = 10^3 \times 0.15/420 = 0.4$ $\mu g/m^3$
$EPC_{AH1a} = 0.075/420 = 0.0002$ ppm
$EPC_{WH1} = 15 \times 0.4 = 6$ $\mu g/\ell$
$EPC_{WH2} = 13.8 \times 0.15 = 2$ $\mu g/\ell$
$EPC_{LH} = 0.2 \times 2 = 0.4$ $\mu g/g$

$EPC_{AE} = 0.1 \times 50{,}000 = 5{,}000$ $\mu g/m^3$
$EPC_{AEa} = 0.1 \times 25 = 2.5$ ppm

MULTIMEDIA ENVIRONMENTAL GOALS

XX
11B040
N,N-DIMETHYLHYDRAZINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.5E2 (0.075)	5.0E4 (25)	0.4 (0.0002)	5,000 (2.5)	
Water, $\mu g/l$ (ppm Wt)			2.25E3		2		
Land, $\mu g/g$ (ppm Wt)			4.5E2		0.4		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			0.4 (0.0002)	5,000 (2.5)	
Water, $\mu g/l$ (ppm Wt)			2		
Land, $\mu g/g$ (ppm Wt)			0.4		

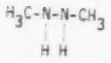
CATEGORY: 11B

N,N'-DIMETHYLHYDRAZINE: $C_2H_8N_2$ (1,2-dimethylhydrazine, dimethylhydrazine). 11B060

N,N'-Dimethylhydrazine is a colorless liquid that fumes in air; ammoniacal odor.

WLN: 1MM1

STRUCTURE:



$H_3C\text{-}\underset{H}{N}\text{-}\underset{H}{N}\text{-}CH_3$

PROPERTIES:

Molecular wt: 60.12; mp: -9; bp: 81^{753}; d: 0.8274; vap. press.: 100 mm at 28° (ref. 4); miscible with water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

N,N'-dimethylhydrazine is not known to occur freely in nature. It is manufactured only in experimental quantities (ref. 4).

TOXIC PROPERTIES, HEALTH EFFECTS:

As a group, hydrazine derivatives are local irritants, convulsants, and hemolytic agents which are absorbed by all routes of administration (ref. 1).

LD_{50} (oral, rat): 100 mg/kg.

N,N'-Dimethylhydrazine is reported to cause oncogenic effects in animals. A possible metabolite of N,N'-dimethylhydrazine, azoxymethane, produced a high yield of carcinomas of the colon in rats (ref. 4).

The EPA/NIOSH ordering number is 4415. The lowest dose to induce a carcinogenic response is 2 mg/kg. The adjusted ordering number is 2207.5

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/2{,}208 = 32\ \mu g/m^3$

Water, Health: $15 \times 32 = 5 \times 10^2\ \mu g/\ell$

Land, Health: $0.2 \times 5 \times 10^2 = 100\ \mu g/g$

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 100 = 11\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 100 = 8\ \mu g/m^3$

$EPC_{WH1} = 15 \times 8 = 120\ \mu g/\ell$

$EPC_{WH2} = 0.4 \times 100 = 40\ \mu g/\ell$

$EPC_{LH} = 0.2 \times 40 = 8\ \mu g/g$

$EPC_{AC2} = 10^3/(6 \times 2{,}208) = 0.075\ \mu g/m^3$

$EPC_{WC} = 15 \times 0.075 = 1.1\ \mu g/\ell$

$EPC_{LC} = 0.2 \times 1.1 = 0.22\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

XX
11B060
N,N'-DIMETHYLHYDRAZINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			3.2E1		0.075		
Water, μg/l (ppm Wt)			5.0E2		1.1		
Land, μg/g (ppm Wt)			1.0E2		0.22		

*To be multiplied by dilution factor

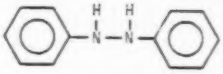
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			8		0.075
Water, μg/l (ppm Wt)			40		1.1
Land, μg/g (ppm Wt)			8.0		0.22

CATEGORY: 11B

WLN: RMMR

1,2-DIPHENYLHYDRAZINE: $C_{12}H_{12}N_2$ (hydrazobenzene).
Colorless tablets from ethanol-ether. 11B080

STRUCTURE:



PROPERTIES:

Molecular wt: 184.26; mp: 131 (decomposes);
insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

1,2-Diphenylhydrazine is formed by mild reduction of azobenzene. In the presence of mineral acids, diphenylhydrazine rearranges to benzidine.

TOXIC PROPERTIES, HEALTH EFFECTS:

Little is reported regarding the acute or chronic toxic properties of diphenylhydrazine. Its properties are probably similar to other hydrazene derivatives. Diphenylhydrazine is an active hemolysin (ref. 1).

LD_{50} (oral, rat): 301 mg/kg.

Exposure to diphenylhydrazine is reported to produce neoplastic effects in rats and mice. The EPA/NIOSH ordering number is 4224. The lowest dose to produce the oncogenic effect is 5,280 mg/kg. The adjusted ordering number is 0.8.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Diphenylhydrazene is on the EPA Consent Decree Priority 1 List.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $45 \times 301 = 1.35 \times 10^4\ \mu g/m^3$
Water, Health: $15 \times 1.35 \times 10^4 = 2.0 \times 10^5\ \mu g/\ell$
Land, Health: $0.2 \times 2.0 \times 10^5 = 4.0 \times 10^4\ \mu g/g$

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 301 = 32\ \mu g/m^3$
$EPC_{AH3} = 0.081 \times 301 = 24\ \mu g/m^3$
$EPC_{WH1} = 15 \times 24 = 360\ \mu g/\ell$
$EPC_{WH2} = 0.4 \times 301 = 120\ \mu g/\ell$
$EPC_{LH} = 0.2 \times 120 = 24\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X

11B080

1,2-DIPHENYLHYDRAZINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.35E4		24		
Water, $\mu g/l$ (ppm Wt)			2.0E5		120		
Land, $\mu g/g$ (ppm Wt)			4.0E4		24		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			24		
Water, $\mu g/l$ (ppm Wt)			120		
Land, $\mu g/g$ (ppm Wt)			24		

REFERENCES: CATEGORY 11B

Azo Compounds, Hydrazine Derivatives - Hydrazine Derivatives

1. Sutton, W. L. Heterocyclic and Miscellaneous Nitrogen Compounds. Industrial Hygiene and Toxicology, Second Revised Edition, Vol. 2, F. A. Patty, Ed., Interscience Publishers, New York, NY (1963).

2. National Academy of Sciences, National Research Council, Committee on Toxicology. Guides for Short-Term Exposures of the Public to Air Pollutants: Guide for Hydrazine Monomethylhydrazine, and 1,1-Dimethylhydrazine. Available from National Technical Information Service, U.S. Department of Commerce, Springfield, VA. PB 244-337 (1974).

3. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

4. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 4, Lyon, France. A World Health Organization (WHO), Geneva (1974).

5. National Institute for Occupational Health and Safety. Criteria for a Recommended Standard: Occupational Exposure to Hydrazines. National Institute for Occupational Health and Safety. U.S. Department of Health, Education, and Welfare, DHEW (NIOSH) Publication No. 78-172 (1978).

CATEGORY 12

NITROSAMINES

SUBCATEGORY: 12A - Aliphatic Nitrosamines

Summary of Subcategory

Total number of compounds in subcategory	5
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	3

Consent Decree compounds included in subcategory: 5

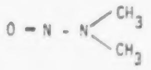
12A020	N-Nitrosodimethylamine
12A040	N-Nitrosodiethylamine
12A060	N-Nitrosodipropylamine
12A080	N-Nitrosodiisopropylamine
12A100	N-Nitrosodipentylamine

CATEGORY: 12A

N-NITROSODIMETHYLAMINE: $C_2H_6N_2O$ (dimethylnitrosoamine).
A yellow liquid. 12A020

WLN: ONN1&1

STRUCTURE:



$O=N-N(CH_3)_2$

PROPERTIES:

Molecular wt: 74.08; bp: 154; d: 1.0048; miscible with water in all proportions; soluble in lipids.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by the anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates. Nitrosoamines are rapidly decomposed by photolysis (ref. 1).

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 μg/m^3; drinking water--<1 μg/day; dietary intake--a few μg/day (ref. 1).

There is some indication that traces of N-nitrosodimethylamine occur in various foods (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

The biological activity of N-nitrosodimethylamine (or its metabolites) includes acute and chronic toxicity, carcinogenicity, and teratogenicity in experimental animals (ref. 1,3). Acute effects include central necrosis of the liver, bleeding, ascites, and jaundice (ref. 4).

LD_{50} (oral, rat): 26 mg/kg (ref. 5).

LC_{50} (inhalation, rat): 78 ppm /4 hours; LC_{Lo} (inhalation, dog): 16 ppm/4 hours (ref. 5).

N-Nitrosodimethylamine has produced cancer in several animal species. The EPA/NIOSH ordering number is 4629. The lowest cumulative dosage resulting in an oncogenic response is 4.375 mg/kg (ref. 5). The adjusted ordering number is 1,076. A daily dosage of 0.075 mg.kg has also produced tumors (ref. 1).

The EPA/NIOSH ordering number based on teratogenicity is 3101. The lowest dosage to produce teratogenic effects is 13 mg/kg. The adjusted ordering number based on teratogenicity is 238.5.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines, including N-Nitrosodimethylamine, appear on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man. Contact with N-nitrosodimethylamine should not be permitted by any route (ref. 4).

N-Nitrosodimethylamine is the subject of a NIOSH Hazard Review Document (ref. 6). OSHA Standards dealing with exposure of employees to N-nitrosodimethylamine have been established, taking into consideration substantial evidence that the compound is known to cause cancer (ref. 7).

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: 7 x 10^4/1,076 = 65 μg/m^3
Water, Health: 15 x 65 = 976 μg/ℓ
Land, Health: 0.2 x 976 = 195 μg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

EPC_{AH2} = 0.107 x 26 = 2.8 μg/m^3
EPC_{AH3} = 0.081 x 26 = 2.1 μg/m^3
EPC_{WH1} = 15 x 2.1 = 31.5 μg/ℓ
EPC_{WH2} = 0.4 x 26 = 10.4 μg/ℓ
EPC_{LH} = 0.2 x 10.4 = 2.1 μg/g
EPC_{AC2} = 10^3/(6 x 1,076 = 0.155 μg/m^3
EPC_{WC} = 15 x 155 = 2.3 μg/ℓ
EPC_{LC} = 0.2 x 2.3 = 0.5 μg/g

EPC_{AT} = 10^3/(6 x 238.5) = 0.70 μg/m^3
EPC_{WT} = 15 x 0.7 = 10.5 μg/ℓ
EPC_{WT} = 0.2 x 10.5 = 2.1

MULTIMEDIA ENVIRONMENTAL GOALS

XX
12A020
N-NITROSODIMETHYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			6.5E1		0.155		
Water, $\mu g/l$ (ppm Wt)			9.76E2		2.3		
Land, $\mu g/g$ (ppm Wt)			1.95E2		0.5		

*To be multiplied by dilution factor

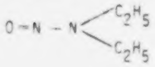
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			2		0.155
Water, $\mu g/l$ (ppm Wt)			10		2.3
Land, $\mu g/g$ (ppm Wt)			2		0.5

CATEGORY: 12A

WLN: ONN2&2

N-NITROSODIETHYLAMINE: $C_4H_{10}N_2O$ (diethylnitrosoamine). A yellow, volatile liquid. 12A040

STRUCTURE:



PROPERTIES:

Molecular wt: 102. 14; bp: 176.9; d: 0.9422^{20}_{4}; moderately soluble in water, soluble in lipids.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by the anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates. Nitrosoamines are rapidly decomposed by photolysis (ref. 1).

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 $\mu g/m^3$; drinking water--<1 µg/day; dietary intake--few µg/day (ref. 1). There is some indication that traces of N-nitrosodiethylamine also occur in various foods (ref. 2).

TOXIC PROPERTIES, HEALTH EFFECTS:

The biological activity of N-nitrosodiethylamine (or its metabolites) include: acute and chronic toxicity, carcinogenicity, and teratogenicity in experimental animals (refs. 1, 2, 5). There is some experimental evidence that acute toxicity of alkyl nitrosoamines decreases with increase in the length of the alkyl chain (ref. 1).

LD_{50} (intravenous, rat): 157 mg/kg (ref. 5).

N-Nitrosodiethylamine has produced cancer in ten animal species (ref. 2). The EPA/NIOSH ordering number is 6929. The lowest dosage affecting an oncogenic response is 12 mg/kg. The adjusted ordering number is 577.

The EPA/NIOSH ordering number based on teratogenic effects is 4304. The lowest dose affecting a teratogenic response is 17 mg/kg. The adjusted ordering number based on teratogenic potential is 253.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines including N-nitrosodiethylamine, appear on EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man.

No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/577 = 120$ $\mu g/m^3$
Water, Health: $15 \times 120 = 1.8 \times 10^3$ µg/ℓ
Land, Health: $0.2 \times 1.8 \times 10^3 = 360$ µg/g

Air, Ecology:
Water, Ecology:
Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 157 = 16.8$ $\mu g/m^3$
$EPC_{AH3} = 0.081 \times 157 = 12.7$ $\mu g/m^3$
$EPC_{WH1} = 15 \times 12.7 = 191$ µg/ℓ
$EPC_{WH2} = 0.4 \times 157 = 62.8$ µg/ℓ
$EPC_{LH} = 0.2 \times 62.8$ µg/g = 13 µg/g
$EPC_{AC2} = 10^3/(6 \times 577) = 0.29$ $\mu g/m^3$
$EPC_{WC} = 15 \times 0.29 = 4.4$ µg/ℓ
$EPC_{LC} = 0.2 \times 4.4 = 0.9$ µg/g

$EPC_{AT} = 10^3/(6 \times 253) = 0.66$ $\mu g/m^3$
$EPC_{WT} = 15 \times 0.66 = 9.9$ µg/ℓ
$EPC_{LT} = 0.2 \times 9.9 = 2$ µg/g

MULTIMEDIA ENVIRONMENTAL GOALS

XX

12A040

N-NITROSODIETHYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.2E2		0.3		
Water, $\mu g/l$ (ppm Wt)			1.8E3		4.4		
Land, $\mu g/g$ (ppm Wt)			3.6E2		0.9		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			13		0.3
Water, $\mu g/l$ (ppm Wt)			63		4.4
Land, $\mu g/g$ (ppm Wt)			13		0.9

CATEGORY: 12A

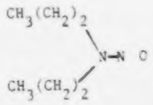
N-NITROSODIPROPYLAMINE: $C_6H_{14}N_2O$

(N-nitroso-N-dipropylamine, propyl nitrosamine, nitrous dipropyl amide, Di-n-propylnitrosamine). 12A060

A golden solid.

WLN: ONN3 & 3

STRUCTURE:



PROPERTIES:

Molecular wt: 130.19; bp: 206^{760}; d:0.9163^{20}_{4};
Slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates. Nitrosoamines are rapidly decomposed by photolysis (ref. 1).

Estimated concentrations of nitrosoamines include the following: air (major population centers)-- 0.2 $\mu g/m^3$; drinking water--< 1 μg/day; dietary intake--a few μg/day (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 480 mg/kg (ref. 5).

Nitrosamines have produced cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney in experimental animals (ref. 8).

The EPA/NIOSH ordering number based on carcinogenicity for N-nitrosodipropylamine is 4,212. The lowest dose effecting a carcinogenic response is 143 mg/kg. The adjusted ordering number is 29.

REGULATORY ACTIONS STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines appear on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man.

No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$7 \times 10^4/29 = 2{,}414\ \mu g/m^3$	Air, Ecology:
Water, Health:	$15 \times 2{,}414 = 3.62 \times 10^4\ \mu g/l$	Water, Ecology:
Land, Health:	$0.2 \times 3.62 \times 10^4 = 7.2 \times 10^3\ \mu g/g$	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 480 = 51.4\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 480 = 38.9\ \mu g/m^3$

$EPC_{WH1} = 15 \times 38.9 = 583.5\ \mu g/l$

$EPC_{WH2} = 0.4 \times 480 = 192\ \mu g/l$

$EPC_{LH} = 0.2 \times 192 = 38\ \mu g/g$

$EPC_{AC2} = 10^3/(6 \times 29) = 5.75\ \mu g/m^3$

$EPC_{WC} = 15 \times 5.75 = 86.3\ \mu g/l$

$EPC_{LC} = 0.2 \times 86.3 = 17\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

X
12A060
N-NITROSODIPROPYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m^3 (ppm Vol)			2.4E3		5.8		
Water, μg/l (ppm Wt)			3.6E4		86		
Land, μg/g (ppm Wt)			7.2E4		17		

*To be multiplied by dilution factor

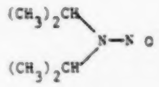
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m^3 (ppm Vol)			39		5.8
Water, μg/l (ppm Wt)			192		86
Land, μg/g (ppm Wt)			38		17

CATEGORY: 12A

N-NITROSODIISOPROPYLAMINE: $C_6H_{14}N_2O$
(nitrosodiisopropylamine, nitrous diisopropylamide).
A solid crystalline material. 12A080

WLN:

STRUCTURE:



PROPERTIES:
Molecular wt: 130.19; mp:48; bp: 194.5; d: 0.9422^{20}_{4};
Slightly soluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates (ref. 1). Nitrosoamines are rapidly decomposed by photolysis (ref. 1).

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 μg/m³; drinking water--<1 μg/day; dietary intake--a few μg/day (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 850 mg/kg (ref. 5)

Nitrosoamines have produced cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney in experimental animals (ref. 8).

The EPA/NIOSH ordering number based on carcinogenicity for N-nitrosodiisopropylamine is 4,111. The dosage producing cancer is 14 g/kg. The adjusted ordering number is 0.29.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines appears on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man. No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 850 = 3.8 \times 10^4$ μg/m³	Air, Ecology:
Water, Health:	$15 \times 3.8 \times 10^4 = 5.7 \times 10^5$ μg/l	Water, Ecology:
Land, Health:	$0.2 \times 5.7 \times 10^5 = 1.14 \times 10^5$ μg/g	Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 850 = 91.0$ μg/m³

$EPC_{AH3} = 0.081 \times 850 = 68.9$ μg/m³

$EPC_{WH1} = 15 \times 68.9 = 1{,}034$ μg/l

$EPC_{WH2} = 0.4 \times 850 = 340$ μg/l

$EPC_{LH} = 0.2 \times 340 = 68$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

12A080
N-NITROSODIISOPROPYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	"Natural Background"*
Air, µg/m³ (ppm Vol)			3.8E4		69		
Water, µg/l (ppm Wt)			5.7E5		340		
Land, µg/g (ppm Wt)			1.14E5		68		

*To be multiplied by dilution factor

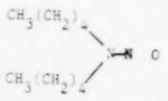
AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, µg/m³ (ppm Vol)			69		
Water, µg/l (ppm Wt)			340		
Land, µg/g (ppm Wt)			68		

CATEGORY: 12A

N-NITROSODIPENTYLAMINE: $C_{10}H_{22}N_2O$
(di-n-amylnitrosamine; dipentylnitrosamine).
A solid. 12A100

WLN: ONN5 & 5

STRUCTURE:



PROPERTIES:
Molecular wt: 186.34.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates. Nitrosoamines are rapidly decomposed by photolysis (ref. 1).

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 $\mu g/m^3$; drinking water--<1 μg/day; dietary intake--a few μg/day (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

LD_{50} (oral, rat): 1,750 mg/kg (ref. 5).

Nitrosamines have produced cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney in experimental animals (ref. 8).

The EPA/NIOSH ordering number based on carcinogenicity for N-nitrosodipentylamine is 4,112. The lowest dosage to produce cancer is 12 g/kg. The adjusted ordering number is 0.34.

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines appears on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man. No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health:	$45 \times 1,750 = 7.88 \times 10^4\ \mu g/m^3$	Air, Ecology:	
Water, Health:	$15 \times 7.88 \times 10^4 = 1.18 \times 10^6\ \mu g/l$	Water Ecology:	
Land, Health:	$0.2 \times 1.18 \times 10^6 = 2.36 \times 10^5\ \mu g/g$	Land, Ecology:	

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1,750 = 187\ \mu g/m^3$

$EPC_{AH3} = 0.081 \times 1,750 = 142\ \mu g/m^3$

$EPC_{WH1} = 15 \times 142 = 2,130\ \mu g/l$

$EPC_{WH2} = 0.4 \times 1,750 = 700\ \mu g/l$

$EPC_{LH} = 0.2 \times 700 = 140\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

12A100

N-NITROSODIPENTYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			7.9E4		142		
Water, $\mu g/l$ (ppm Wt)			1.2E6		700		
Land, $\mu g/g$ (ppm Wt)			2.4E5		140		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			142		
Water, $\mu g/l$ (ppm Wt)			700		
Land, $\mu g/g$ (ppm Wt)			140		

REFERENCES: CATEGORY 12A

Nitrosoamines - Aliphatic Nitrosoamines

1. U.S. Environmental Protection Agency, Office of Research and Development. Scientific and Technical Assessment Report of Nitrosoamines. Star Series. U.S. Environmental Protection Agency, Washington, DC EPA-600/6-77-001 (1976).

2. International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 1, Lyon, France. A World Health Organization Publication (WHO), Geneva (1972).

3. Magee, P. N., et al. N-Nitroso Compounds and Related Carcinogens. Chemical Carcinogens. C. E. Searle, Ed., American Chemical Society, Washington, DC (1976).

4. American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, OH (1974).

5. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

6. Occupational Safety and Health Administration, Department of Labor. Hazard Review Document. Federal Register 39, No. 20, 3756-3757 (1974).

7. U.S. Department of Labor. Occupational Safety and Health Standards. Toxic and Hazardous Substances. Title 29 Code of Federal Regulations, Part 1910.

8. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

CATEGORY 12

NITROSAMINES

SUBCATEGORY: 12B - Aromatic Nitrosamines

Summary of Subcategory

Total number of compounds in subcategory	2
number of parent compounds with subspecies	0
number of subspecies	0
Number of parent compounds with no MEG values	0
Number of parent compounds with natural background levels only	0
Number of parent compounds with Ambient Level Goals based on evidence of carcinogenicity or teratogenicity	2

Consent Decree compounds included in subcategory: 2

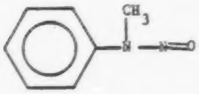
12B020	N-Methyl-N-nitrosoaniline
12B040	N-Nitrosodiphenylamine

CATEGORY: 12B

N-METHYL-N-NITROSOANILINE: $C_7H_8N_2O$
(N-methyl-N-nitroso-benzenamine, methyl phenyl nitrosamine, nitrosomethylaniline, N-nitroso-N-methylaniline, N-nitrosophenylamine, methylnitrosophenylamine). 12B020
A yellow solid or liquid.

WLN: ONN1 & R

STRUCTURE:



PROPERTIES:
Molecular wt: 136.17; mp: 14.7; 225 (decomposes); d:1.1240$_4^{20}$; insoluble in water.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates (ref. 1). Nitrosoamines are rapidly decomposed by photolysis.

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 μg/m^3; drinking water--< 1μg/day; dietary intake--a few μg/day (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Nitrosoamines are suspected of causing cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney (ref. 2).

N-Methyl-N-nitrosoaniline has also been shown to produce teratogenic effects (ref. 3).

The EPA/NIOSH ordering number based on carcinogenicity is 4,213. The lowest dosage producing a carcinogenic response is 78 mg/kg. The adjusted ordering number based on carcinogenicity is 54. The EPA/NIOSH ordering number based on teratogenicity is 4,101. The lowest dosage producing teratogenic effects is 140 mg/kg. The adjusted ordering number is 29.

LD_{50} (oral, rat): 225 mg/kg (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines appear on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man. No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/54 = 1.3 \times 10^3$ μg/m^3

Water, Health: $15 \times 1.3 \times 10^3 = 1.9 \times 10^4$ μg/l

Land, Health: $0.2 \times 1.9 \times 10^4 = 3.9 \times 10^3$ μg/g

Air, Ecology:

Water, Ecology:

Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 225 = 24.0$ μg/m^3

$EPC_{AH3} = 0.081 \times 225 = 18.2$ μg/m^3

$EPC_{WH1} = 15 \times 18.2 = 273$ μg/l

$EPC_{WH2} = 0.4 \times 225 = 90$ μg/l

$EPC_{LH} = 0.2 \times 90 = 18$ μg/g

$EPC_{AC2} = 10^3/(6 \times 54) = 3.09$ μg/m^3

$EPC_{WC} = 15 \times 3.09 = 46.4$ μg/l

$EPC_{LC} = 0.2 \times 46.4 = 9$ μg/g

$EPC_{AT} = 10^3/(6 \times 29) = 5.75$ μg/m^3

$EPC_{WT} = 15 \times 5.75 = 86.3$ μg/l

$EPC_{LT} = 0.2 \times 86.3 = 17$ μg/g

MULTIMEDIA ENVIRONMENTAL GOALS

X

12B020

N-METHYL-N-NITROSOANILINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, $\mu g/m^3$ (ppm Vol)			1.3E3		3		
Water, $\mu g/l$ (ppm Wt)			1.9E4		46		
Land, $\mu g/g$ (ppm Wt)			3.9E3		9		

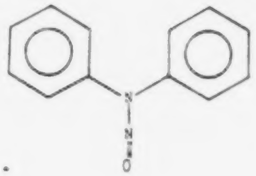
*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, $\mu g/m^3$ (ppm Vol)			18.2		3
Water, $\mu g/l$ (ppm Wt)			90		46
Land, $\mu g/g$ (ppm Wt)			18		9

CATEGORY: 12B
N-NITROSODIPHENYLAMINE: $(C_6H_5)_2N_2O$
(nitrous diphenylamide, diphenylnitrosamine).
A yellow crystalline solid. 12B040

WLN: ONNR&R

STRUCTURE:



PROPERTIES:

Molecular wt: 198.23; mp: 66.5.

NATURAL OCCURRENCE, CHARACTERISTICS, ASSOCIATED COMPOUNDS:

Formation of nitrosoamines may occur in air, water, soil, food, and in the gastrointestinal tract. The precursors associated with nitrosoamine formation (secondary amines and nitrites or nitrogen oxides) are ubiquitous in nature. Amines may be formed by anaerobic decay of nitrogenous matter (plants, animals, excrement), and nitrites may be formed by the microbial reduction of nitrates (ref. 1). Nitrosoamines are rapidly decomposed by photolysis.

Estimated concentrations of nitrosoamines include the following: air (major population centers)--0.2 $\mu g/m^3$; drinking water--<1 μg/day; dietary intake--a few μg/day (ref. 1).

TOXIC PROPERTIES, HEALTH EFFECTS:

Nitrosoamines are suspected of causing cancers of the lung, nasal sinuses, brain, esophagus, stomach, liver, bladder, and kidney (ref. 2).

N-nitroso-diphenylamine is reported to produce tumors in mice (ref. 3) and in rats (ref. 4).

The EPA/NIOSH ordering number is 4213. The lowest dosage producing cancer is 1,000 mg/kg. The adjusted ordering number is 4.2.

LD_{50} (oral, rat): 1,650 mg/kg (ref. 3).

REGULATORY ACTIONS, STANDARDS, CRITERIA, RECOGNITION, CANDIDATE STATUS FOR SPECIFIC REGULATION:

Nitrosoamines appear on the EPA Consent Decree List with an assigned priority of 1.

Nitrosoamines are included in the ACGIH List of Industrial Substances Suspect of Carcinogenic Potential for Man. No TLV is specified.

MINIMUM ACUTE TOXICITY CONCENTRATIONS:

Air, Health: $7 \times 10^4/4.2 = 1.7 \times 10^4\ \mu g/m^3$ Air, Ecology:
Water, Health: $15 \times 1.7 \times 10^4 = 2.5 \times 10^5\ \mu g/l$ Water, Ecology:
Land, Health: $0.2 \times 2.5 \times 10^5 = 5 \times 10^4\ \mu g/g$ Land, Ecology:

ESTIMATED PERMISSIBLE CONCENTRATIONS:

$EPC_{AH2} = 0.107 \times 1{,}650 = 176.6\ \mu g/m^3$
$EPC_{AH3} = 0.081 \times 1{,}650 = 133.7\ \mu g/m^3$
$EPC_{WH1} = 15 \times 133.7 = 2{,}005.5\ \mu g/l$
$EPC_{WH2} = 0.4 \times 1{,}650 = 660\ \mu g/l$
$EPC_{LH} = 0.2 \times 660 = 132\ \mu g/g$
$EPC_{AC2} = 10^3/(6 \times 4.2) = 40\ \mu g/m^3$
$EPC_{WC} = 15 \times 40 = 600\ \mu g/l$
$EPC_{LC} = 0.2 \times 600 = 120\ \mu g/g$

MULTIMEDIA ENVIRONMENTAL GOALS

12B040

N-NITROSODIPHENYLAMINE

EMISSION LEVEL GOALS							
	I. Based on Best Technology		II. Based on Ambient Factors				
	A. Existing Standards	B. Developing Technology	A. Minimum Acute Toxicity Effluent		B. Ambient Level Goal*		C. Elimination of Discharge
	NSPS, BPT, BAT	Engineering Estimates (R&D Goals)	Based on Health Effects	Based on Ecological Effects	Based on Health Effects	Based on Ecological Effects	Natural Background*
Air, μg/m³ (ppm Vol)			1.7E4		40		
Water, μg/l (ppm Wt)			2.5E5		600		
Land, μg/g (ppm Wt)			5.0E4		120		

*To be multiplied by dilution factor

AMBIENT LEVEL GOALS					
	I. Current or Proposed Ambient Standards or Criteria		II. Toxicity Based Estimated Permissible Concentration		III. Zero Threshold Pollutants Estimated Permissible Concentration
	A. Based on Health Effects	B. Based on Ecological Effects	A. Based on Health Effects	B. Based on Ecological Effects	Based on Health Effects
Air, μg/m³ (ppm Vol)			134		40
Water, μg/l (ppm Wt)			660		600
Land, μg/g (ppm Wt)			132		120

REFERENCES: CATEGORY 12B

Nitrosoamines - Aromatic Nitrosoamines

1. U.S. Environmental Protection Agency, Office of Research and Development. Scientific and Technical Assessment Report of Nitrosoamines. Star Series. U.S. Environmental Protection Agency, Washington, DC EPA-600/6-77-001 (1976).

2. Sax, N. I., Ed. Dangerous Properties of Industrial Materials, Fourth Edition. Van Nostrand Reinhold Co., New York, NY (1975).

3. Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. Prepared by Tracor Jitco Inc., Rockville, MD for National Institute for Occupational Safety and Health. HEW Publication No. (NIOSH) 76-191 (1976).

4. Magee, P. N., et al. N-Nitroso Compounds and Related Carcinogens. Chemical Carcinogens. ACS Monograph 173. C. E. Searle, Ed., American Chemical Society, Washington, DC p. 491-625 (1976).

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